GOVERNMENT OF INDIA, MINISTRY OF WORKS, MINES, AND POWER.



Report of the Ad-hoc Committee in connection with the Investigations of the River-Valley Projects.

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REPORT OF THE AD-HOC COMMITTEE

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REPORT OF THE AD-HOC COMMITTEE, APPOINTED BY THE GOVERNMENT OF INDIA IN THE MINISTRY OF WORKS, MINES, AND POWER, IN CONNECTION WITH THE INVESTIGATIONS OF THE RIVER-VALLEY PROJECTS, PREPARED BY THE CENTRAL WATERPOWER, IRRIGATION, AND NAVIGATION COMMISSION.

"We, the members of the Ad-hoc Committee met on 11th May 1948, and again on 18th May 1948, to examine the projects and estimates prepared by CWINC in connection with the Kosi, Narbada, Tapti, Sabarmati, C. P. and Berar rivers, Bastar State rivers, Assam Valley, and Coorg, in accordance with the terms of reference at Appendix I, page 9.

Messrs. Man Singh, Member, M. D. Mithal, Director, and G. N. Pandit and K. M. Bhatia, Project Officers, presented the proposals and explained the various features of the proposed developments.

They recast the relevant estimates in the light of some modifications proposed during the first day's meeting.

Item I of the Terms of Reference.

I. What would you consider to be a reasonable cost of investigations of a project in relation to the overall capital cost of that project?

As to the reasonable ratio which the cost of investigations of a project should bear to the overall cost of the project, in our opinion, no hard and fast figure can be laid down. Generally speaking, the cost of preliminary investigations will not be less than one per cent of the overall capital cost. It may go up as high as five per cent, depending on the nature and features of the project.

1. KOSI PROJECT.

(APPENDIX II)

Items II to VI of the Terms of Reference.

- II. Are the proposals in respect of each one of the above projects, as put forward by CWINC, in order?
- III. Is the cost of investigations, provided in the above proposals, justified?
- IV. Kccping in mind the proposed programme and priorities of investigations, is the proposed strength of exgineering staff, provided in the estimates for the purpose, adequate?
- V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

The proposals in respect of investigations of the Kosi project, as put forward by CWINC, are in order.

The provision of Rs. 65 lakhs for investigations while adequate for the period in question appears to be on the low side for the completion of investigations. It will be more like one crore of rupees. The Kosi Dam, when constructed, will be the highest in the world—130' higher than the present highest dam, the Boulder Dam on the Colorado river in U. S. A. which is 726' above rock bottom. The dam site is situated in a highly seismic zone. The exploratory work and investigations at the site must therefore be very thoroughly done.

The proposed strength of engineering staff is adequate, for the present, but will have to be substantially increased if the recommendations under item VI are accepted.

The actual work of investigations at site was inspected by Dr. J. L. -Savage and Mr. A. N. Khosla and is on sound lines. With more mechanisation in exploratory work and the operation of diamond drills—now that the Drill Foreman has joined—the work will be considerably accelerated.

Item VI. In respect of the Kosi Project in particular, what are your views as to:

- (a) the desirability of obtaining from Disposals construction machinery to the extent of nearly 40 lacs in anticipation of the construction of barrage canals and dam; the expenditure to be treated as suspense in the first instance and charged to the project when the latter receives sanction: this course was followed in connection with the Hirakud Dam Project, and
- (b) the desirability of
 - (i) undertaking the construction of a meter-gauge railway line to the barrage and dam site (length nearly 40 miles), and
 - (ii) undertaking the construction of the barrage and canal systems in advance of the construction of the dam.

In view of the recurring havoc caused by the vagaries and floods of the Kosi, and the need for growing more food for the country, the construction of this project is an urgent and vital necessity. This project with a potential development of 2 million k. ws. of power and 3 to 4 million acres of annual irrigation, offers immense scope of development in the industrial and agricultural fields. Therefore, any measures that are calculated to accelerate the work of investigations and, later, construction of this project, deserve to have the full support of the Government.

We fully endorse the proposals under (a), and (b) (i) and (b) (ii).

The exploratory work on the dam will take some time as also the trial load analysis which, it is hoped, the U.S. Bureau of Reclamation will undertake to do. In the meantime machinery and staff can be assembled and trained on the construction of the Barrage and Canal systems and kept ready for the bigger construction programme for the dam. In this way large areas of land will be brought under irrigation in advance of the completion of the dam and the country prepared to receive the full benefits from the dam 3 to 4 years in advance, thus bridging the gap between completion of the project and development of its potential.

2. NARBADA VALLEY PROJECTS.

(APPENDIX IV)

Items II to V of the Terms of Reference.

- II. Are the proposals in respect of each one of the above projects, as put forward by CWINC, in order?
- III. Is the cost of investigations, provided in the above proposals, justified?
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff, provided in the estimates for the purpose, adequate?
- V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

The Narbada basin appears to hold great potential of development, and such development is likely to have far-reaching effect on the economic advancement of the country in general, and the basin in particular. It appears feasible to bring under irrigation 37,00,000 acres of cultivated and cultivable land in the basin, generate continuous power of over a million k. ws, and extend navigation from the river's outfall in the sea right up to and beyond Hoshangabad i.e., almost to the heart of the country. The principal works involved would be construction of about eight storage reservoirs, a number of barrages and three systems of canals and some navigation locks. estimate for investigation of the total plan has been prepared and amounts to Estimates, prepared on the basis of expenditure from year to year, which were submitted to Government for sanction, were also placed be-The amounts were Rs. 1,70,740 for 1947-48 and Rs. 25,91,000 for These have been examined by us in detail and appear to be in 1948-49. order.

In this connection Mr. Man Singh pointed out that the cost of topographical survey, provided in the estimates, could be brought down considerably if the contour-survey of the commanded-areas by the Survey of India Department could be reduced to just what was essential to enable the CWINC staff to pick up the channel alignments roughly, and thereafter so the detailed work themselves. This, he said, would have the added advantages, first, of reducing the work of the Survey of India who had already too heavy a programme for the staff they have, and secondly train up the CWINC staff for such work. He said, he had tried this in Bengal and the resulting work was quite accurate. Mr. Pandit said, he was working on this basis in the Tapti basin and calculated that the overall cost would be reduced to half. This, in our opinion, is a good suggestion and should be adopted wherever possible. Taking the resulting economy into account the total cost of investigations will come down to about Rs. 74 lakhs.

At this stage we were also apprised of the views of the Secretary, W. M. P., and the reactions of the Chairman, CWINC, regarding cutting short the programme of work on account of present day shortages of men and materials. The notes on the subject are appended to this report (Appendix III). We entirely agree with this view and suggest that it will be desirable to restrict the work in the first 2-3 years to only such projects as will give the maximum results in the shortest possible time. Judged from this criterion, we recommend that investigations be concentrated on the following:—

Bargi Project. The project envisages construction of 3 dams and a system of canals to command 18,00,000 acres. It is calculated that in addition it would be possible to generate 80,000 k. ws. of firm power. As most of the water will be used up for irrigation it might not be possible to make the navigational feature very attractive.

Tawa Project. This envisages construction of a dam on the tributary Tawa just above its outfall into the Narbada a few miles above Hoshangabad. A dam of 170 feet height will intercept the entire run off from a catchment of 2,340 square miles. An area of 11,00,000 acres would be commanded from the reservoir itself for irrigation. The power potential is likely to be 12,700 k. ws. (continuous).

Punasa Project. A dam of 237 feet height will intercept almost the entire residual run-off of the main river at this site. It is proposed to reserve a portion of the capacity for controlling the floods which occur frequently in the Broach district of Gajrat in Bombay Province. Taking this into account, the power potential of this project would be in the neighbourhood of 2,23,000 k. ws. continuous. The lake would be navigable right up to its upper end, very near Hoshangabad.

Barrage and canal system for the Broach District. With the regulated supplies available from the Punasa Project it would be possible to command the entire cultivated area of Broach district, measuring about 8,00,000 acres for perennial irrigation.

In addition to concentrated investigations on these projects we also recommend that the cost of collection of such essential data as discharge and silt observations at various important stations, meteorological, mineral, navigational and economic surveys and special tools and plant required should be provided for in the estimate for investigation of the projects on a basin-wide basis.

At our request fresh detailed estimates have been prepared to cover these investigations and these amount to Rs. 64,97,000. The cost will be spread over a period of three years, Rs. 26,97,000 in the first, Rs. 19,00,000 in the second and Rs. 19,00,000 in the third year.

The strength of engineering staff provided is adequate for the purpose in view.

While examining this project it was brought to our notice that there is a proposal to utilize the land to be commanded for irrigation by the Bargi and Tawa projects for resettling and rehabilitating refugees from Sind and Western

Pu njab. If, on this account, therefore, the investigations have to be speeded up, and construction has to be launched upon simultaneously, the staff for the setwo projects will have to be considerably strengthened to suit the pace at which progress would be demanded.

3. TAPTI VALLEY PROJECTS.

(APPENDIX V)

Items II to V of the Terms of Reference.

- II. Are proposals in respect of each one of the above projects, as put forward by CWINC, in order?
- III. Is the cost of investigations provided in the above proposals justified $^{\circ}$
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering s'off, provided in the estimate for the purpose, adequate?
- V. Is it possible, by a re-arran grant of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

Examination of the proposals reveal that potential of development in this basin is also fairly great, although it is not likely to be as attractive as in the case of the Narbada basin. The plan envisages construction of six dams and three barrages together with their canal systems. Of these the developments on Girna river are being investigated and undertaken by the Govern-The ment of Bombay. estimated \mathbf{for} investigations cost rest of the project amounts to Rs. 42,25,034. The yearly estimates for the years 1947-48 and 1948-49, amounting to Rs. 2,60,540 and Rs. 20,56,000 respectively, were also placed before us. The provisions are in order. But the cost of surveys should be reduced by the CWINC doing most of the work, leaving only the essential part to be done by the Survey of India.

In this case also, we suggest that attention for the present be concentrated on the lowermost dam at Ukai and the Kakrapara barrage and canal system and only silt observations, and meteorologic 1, mineral, navigation and economic surveys be carried out for the rest of the basin, for the present. At our request an estimate to cover this limited objective has been prepared and amounts to Rs. 19,95,500. This cost will be spread over a period of two years, *i.e.*, Rs. 12,00,000 in the first year, and Rs. 7,95,500 in the second year. The provisions and the strength of the engineering staff for the purpose are adequate.

4. SABARMATI PROJECT.

(APPENDIX VI)

Items II to V of the Terms of Reference.

- II. Are the proposals in respect of each one of the above projects, as put forward by CWINC, in order?
- III. Is the cost of investigations provided in the above proposals justified?
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff, provided in the estimates for the purpose, adequate?
- V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

This river passes by the industrial town of Ahmedabad where, we are informed, the domestic water supply problem is acute. Authorities interested in the development of the basin are Bombay Province including Ahmedabad Municipality, Baroda State, Idar State and some States of Mahikanta, Sabar Kantha Agencies. Part of the catchment area lies in Udaipur State of the Rajputana Union. Projects for irrigation and improvement of domestic

water supplies have been prepared by various agencies from time to time. But owing to disagreement regarding water-rights and other matters nothing Recently, we are informed, in a conference of represenhas matured so far. tatives of various interests held at Bombay, it was decided to entrust the development of the basin on a unified basis to the CWINC in the hope that better progress will be made in finalising and then executing the projects. Some engineering staff was offered to be provided by governments of Bombay and Baroda for manning the organisation to be set up for the investigations. Accordingly, an estimate for preliminary investigations amounting to Rs. 15,10,000 was prepared. This and the year to year estimates of Rs. 28,000 for the year 1947-48 and Rs. 5,20,000 for the year 1948-49 have been examined No contour-levels are available in this basin. Maps of hilly portion merely show the form lines. It has, therefore, not been possible to indicate precisely the development that might be possible. Some preliminary investigations were done, in connection with a dam project at Dharoi. of the survey indicates roughly that the project would ensure irrigation for 1,00,000 acres and put the water supply position of Ahmedabad town on a surer footing. We recommend that, in the first instance, activities might be restricted to this one project only in this basin. At our request the estimate has been recast to provide for the necessary investigations of this project. It amounts to Rs. 7,87,000 and expenditure will be spread over two years, in the first year being Rs. 4,34,000 and in the second year Rs. 3,53,000. provisions are reasonable and the staff provided is adequate.

In this, as in the case of Narbada and Tapti, discharge and silt observations, meteorological observations etc., will be taken up on basin-wide scale and provision has been made in the recast estimate.

5. C. P. & 6. BASTAR PROJECTS.

(APPENDIX VII)

Items II to V of the Terms of Reference.

- II. Are the proposals in respect of each one of the above projects, as put forward by CWINC, in order
- III. Is the cost of investigations, provided in the above proposals justified?
- IV. Keeping in mind 'he proposed programme and priorities of investigations, is the proposed strength of engineering staff, provided in the estimates for the purpose, adequate?
- V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

5. (C.P.)

Besides Narbada and Tapti basins, it is also proposed to undertake investigations for development in the mid-Godavari and upper Mahanadi basins. The projects in the mid-Godavari basin were principally on the Wainganga and Wardha tributaries of the Godavari. In view of the fact that a very big project is being undertaken by the C. P. engineers on the lower Wainganga we consider it desirable for the present for the CWINC to concentrate on the upper Mahanadi basin only. There are four projects, three on the tributaries and one on the main river which appear to be very promising and will result in assuring irrigation for 6,50,000 acres of land and enable 23,000 k.ws. of continuous power being generated. The regulated supplies from these projects will also increase the power potential of the Hirakud and other lower projects on lower Mahanadi. The work of investigations could be taken up by one Division.

At our request the estimate for investigations has been recast and now amounts to Rs. 27,04,500 for the Mahanadi basin in place of Rs. 47,44,000 for the Mahanadi and Godavari basins. In the recast estimate costs of surveys by Survey of India have been reduced as in other cases. Other provisions are reasonable and the staff provided adequate.

As in the case of other valley investigations, the silt mineral, meteorological and other general investigations will be carried out over the whole basin.

6. (BASTAR).

The area of what until recently was known as Bastar State is very sparsely populated. Cultivation is done on a very restricted scale and mineral resources, which are very great have not at all been explored or exploited. A good part of the state is on a plateau at an elevation of over 2,000 ft. above mean sea level. The rainfall is good and the climate exhilarating.

On these accounts it is not unlikely that the territory might be utilized for resettling and rehabilitating refugees from Western Pakistan. This, we find, can be achieved without disturbing or encroaching upon the areas occupied by the tribal population.

The principal river of the state, Indravati, has great potential for Power development which is absolutely necessary for the rich iron ores aggregating to over 1,000 million tons, containing 68 per cent to 70 per cent pure iron to be utilised for manufacture of steel etc. Some good sites have been located where development will be very attractive. The power potential of these projects will be in the neighbourhood of 3,00,000 k.ws. continuous.

On the Sabri river one project has been located which would enable bringing under irrigation 6,90,000 acres of land, and produce 14,000 k.ws. of continuous power.

We agree that all these projects should be investigated on a priority basis and the proposal to set up one Division for the purpose has our approval. The estimate amounts to Rs. 27,04,000 and the expenditure would be spread over 3 years. The provisions made in the estimate are reasonable and the staff proposed adequate.

One Superintending Engineer would be necessary to control the two Divisions in this region, *i.e.*, one in the Upper Mahanadi and the other in Bastar State. The estimates provide for the entertainment of a Superintending Engineer and his office staff.

Total expenditure on investigations in C. P. and Bastar rivers will thus be Rs. 54,09,000 spread over three years. The yearly expenditure will be Rs. 16,00,000 in the first year, Rs. 20,00,000 in the second year and Rs. 18,09,000 in the third year. They are in order and compare favourably with the estimates for the years 1947-48 and 1948-49 amounting to Rs. 16.52 lacs (Provision was for 13 months only).

7. ASSAM PROJECTS. (APPENDIX VIII)

Items II to V of the Terms of Reference

- II. Are the proposals in respect of each one of the above projects, as put forward by CWINC, in order?
- III. Is the cost of investigations provided in the above proposals justified 2
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff, provided in the estimates for the purpose, adequate?
- V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

The territory, with its magnificient rivers and the narrow gorges in the Himalayan ranges through which they flow, offers an almost unlimited scope for power development. CWINC, in consultation with the Government of

Assam, have selected for the present four projects for preliminary investigations. An estimate amounting to Rs. 50,00,000 to cover the cost and programmes of expenditure for the years 1947-48 and 1948-49 amounting respectively to Rs. 2,67,000 and Rs. 20,41,000 have been examined by us and are, in our opinion, reasonable. But, for considerations similar to those which have led us to recommend curtailment of activities in other basins, we suggest that only two out of the four projects should be taken up for investigation at present. These, in our opinion, should be Manas and Dihang. The priorities allotted to the projects should be changed to give Manas the higher, as it is close to the rest of India and not too far from the industrial area of Assam. This project has a bigger irrigation potential as well. Besides, the channel below is likely to provide a link for the navigation canal which is being thought of from the Teesta barrage to the Brahmaputra. The Dihang will be No. 2 priority, but taken up simultaneously for investigation.

In addition to discharge and silt observations, meteorological, mineral and economic surveys, and surveys for navigation should be planned for the entire area. A recast estimate to cover our recommendation has been prepared and now amounts to Rs. 30,73,700 spread over two years. Expenditure will be Rs. 14,00,000 in the first and Rs. 16,73,700 in the second year. The provisions are reasonable and staff provided adequate, one of the three divisions previously provided having been curtailed.

8. COORG PROJECTS.

(APPENDIX IX)

Items II to V of the Terms of Reference.

- II. Are the proposals in respect of each one of the above projects, as put forward by CWINC, in order?
- III. Is the cost of investigations provided in the above proposals justified?
- IV. Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff, provided in the estimates for the purpose, adequate?
- V. Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these projects?

The estimate to investigate the projects in Coorg viz. Herangi Irrigation and Power Project, the Baropole Hydel Project, the Lakshamantirtha Irrigation Project and the projects for renovation of irrigation tanks, amounting to Rs. 6,64,740 and one for the year 1948-49 amounting to Rs. 2,24,000 have been examined. We suggest that work of investigations on renovation of tanks be omitted and the proposals should be amended to provide for only two S. D. Os. and the adequate number of subordinates and clerical staff instead of one Executive Engineer and three S. D. Os. The work of investigations could be completed in about two years. The estimate has accordingly been amended and now amounts to Rs. 4,52,000 and the expenditure for the year 1948-49 and 1949-50 will be respectively Rs. 2,20,000 and Rs. 2,32,000. The provisions are reasonable and the expenditure will be justified. The staff provided is adequate.

GENERAL.

Before concluding we would like to bring to the notice of the Government that some special allowance should be given to officers and men on field duties in connection with investigation and construction of such projects as the localities where they have to work are generally unhealthy, communications are difficult and the work arduous. Unless an incentive in the shape of such allowance is given people would generally prefer to be on less arduous jobs eisewhere This particular point was not amongst our terms of reference

but we feel it would not be fair not to bring this aspect to the notice of Government, as it is only contented staff that could be relied upon to do the work efficiently and economically specially in these days of shortages.

The original estimates placed before us are appended, as also the estimates now prepared which are approved by us."

(Sd.) A. N. KHOSLA. (Sd.) J. L. SAVAGE. (Sd.) M. NARASIMHAIYA.

DATED NEW DELHI; the 18th May 1948.

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APPENDIX I

Terms of Reference of the Ad-hoc Committee, appointed by the Government of India in the Ministry of Works, Mines and Power in connection with the investigations of the River-valley projects, sponsored by the C.W.I.N.C.

- "The projects concerned are :-
 - 1. Kosi,
 - 2. Narbada,
 - 3. Tapti,
 - 4. Sabarmati,
 - 5. Central Provinces
 - & 6. Bastar rivers,
 - 7. Asasm Valley, and
 - 8. Coorg.

Item I—What would you consider to be a reasonable cost of investigations of a project in relation to the overall capital cost of that project?

Item II—Are the proposals in respect of each one of the above projects, as put forward by C.W.I.N.C., in order ?

Item III—Is the cost of investigations provided in the above proposals justified?

Item IV—Keeping in mind the proposed programme and priorities of investigations, is the proposed strength of engineering staff provided in the estimates for the purpose adequate?

Item V—Is it possible, by a re-arrangement of programme or priorities, to reduce expenditure, or at least spread it over a longer period, in respect of one or more of these porjects?

Item VI—In respect of the Kosi Project, in particular, what are your views ? as to

- (a) the desirability of obtaining from Disposals construction machinery to the extent of nearly Rs. 40 lacs in anticipation of the construction of barrage, canals and dams; the expenditure to be treated as suspense in the first instance and charged to the project when the latter receives sanction: this course was followed in connection with the Hirakud Dam Project; and
- (b) the desirability of
- (i) undertaking the construction of a meter gauge railway line to the barrage and dam sites (length nearly 40 miles), and
- (ii) undertaking the construction of the barrage and canal systems in advance of the construction of the dam."

IMPORTANT DATA IN RESPECT OF VARIOUS PROJECTS

No Mame of Drotost	timate by years in lac	dimate by years in lac			Total A cost of priority	vear	allo = ment required from f year to year 7	morii.		rot	LOIFNITAL	Whole Basin	MEN				Priority Projects	rojects	
	181	2nd	3rd	for the ap	pproved 1 by the	approved 1948-49 1949-50 1950-51 Flood con by the	949-50 1	950-51	Flood control	Irriga millio	Irrigation in million acres	and the state of t		Plood non-feed	Irriga	Irrigation in million acres	Continuous		
				basin in lac of rupees	Ads-100c Com- mittee					Gross comm- anded area	Inig- able area	Power in K. W.	Navigation		Gross comm- anded area	Irriga- ble area	K.W.	Navigation	Rrmarks
5	န	4		9	7	œ	6	10	11	12	13	14	15	16	17	18	19	20	21
Kosi	16-44	15.00	:	One crore (approx)	One crore	18.32	14.00	14.00*	Would reduce 7 lakhs flood to 2½ lakh flood.	7.0	4.20	1.3 Million	Ganges junction to 50 miles above Barahakshetra in Nepal.		Same	Same as whole Basin	asin	Ва	Barrage and canals mey be constructed in advance of the data,
Nathada Valley	17.1	25-91	i	95.91	64.97	26.97	19.00	19.00	Complete	3.7	2.52	Over one million kws.	Sea to Hoshangabad Complete 400 miles	1 Complete	3.7	2.22	3,16,000	Sea to Hoshanga bad 400 miles	ų.
Tapti Valley	2.605	20.56	:	42.25	19.955	12.0	2.955	i	Complete	1.29	0.774	63,000	63,000 Kakrapara to Surat Complete 40 miles.	Complete	0.7	0.42	48,000	Kukrapara to Surat 40 miles	
Sabarmati e d d b verer	. 0.28	5.20	:	15.10	78.7	4.34	8.58	ŧ	Complete	0 2	0.12	Not calculated	Not calculated Gulf of Combay to Junction of Hathmati	Partial	0.1	90.0	:	Gulfof Combay to tunction of Hathmati	Reserving 100 cuses- for Ahmedabad water supply.
Bastar	\$2.2 -	14.29	:	71.17 54.09	54.09	16.00 20.90	20.90	18.00	18-00 No problem	2.1	1.26	310,000	Baster will open up to navigation through Godavari	. Complete	1.35	0.81	184,000 with possibility of 3 lacs by raising Bhopal Patnam	•	Investigations on Mid Godavari basir. have been omit- ted
Assen Valley	2.67	20.41	:	£0.00 \$	30.737	14.00 16.737	16-787	:	Partial exact extent can not be worked on	6.	1.56	16,00,000	Barak & Dihang Manes will be Navigable for considerable dis- tances to land	g Partial .	Not calcu- lated	Not calcu- lated	F1	Manes and Dih- ang will be navi- gable for con- siderable dis- tances up stream of the dan stres on them	Mane, and Dihang to be investigated Barak & Somesh- warf to be omi- tick for the present
Goorg	2.54	i	÷	6-6474	4.52	2.20	2.32	:	No problem	0.12	0.72	49,500	Nii	No problem	0.01	900.0	49,500	Ni Be	Renovation of Irrigation and pisciculture tanks one itted.

* While other investigations are expected to finish by 1950 thus enabling construction to be taken in hand before that year, survey work in the Kosi flood plain for irrigation and drainage work will containe for a number of years and the construction of canals and distributaries will progress as survey proceeds.

APPENDIX 11

KOSI PROJECT

REPORT

At their meeting held on the 29th July, 1946, the Standing Finance Committee agreed to an expenditure of Rs. 31·44 lakhs on the preliminary surveys and investigations for the Kosi Project during the year 1946-47 and 1947-48. This sanction was communicated in W. M. P. letter No. D.W. 1201 (1), dated, the 27th May, 1946.

- 2. The previous estimate had been framed with a view to ascertain the feasibility of the scheme. Investigations so far carried out have now shown that the scheme is definitely feasible and therefore investigations have now to be carried out in greater detail. Owing to difficult situation of the site and the enormity of the magnitude of the work, the detailed investigations will have to extend beyond 1950 but they shall have progressed sufficiently by March 1950 to enable construction to be taken in hand. This estimate amounting to Rs. 65,26,000 has therefore been prepared to cover the period ending March 1950 and includes the amount of Rs. 31,44,000 already sanctioned. For completing the investigations the cost will be of the order of rupees one crore.
- 3. The present estimate covers the cost of investigations for the dam (excluding the cost of trial load analysis to be carried out in America, the cost for which will be included in the supplementary estimate for overall investigations) and the investigations for the barrage site and surveys for a portion of the area to be irrigated to the east of the Kosi. The survey work, owing to its magnitude, will take a number of years to complete. The construction of the barrage can however be taken in hand without waiting for the completion of surveys for the irrigation area and the construction of irrigation system can proceed as surveys progress. For the present, it is proposed to concentrate on the surveys and investigations of the canal system to the east of the Kosi. The cost of the remaining surveys will be included in the supplementary estimate for the overall investigations.
- 4. Credit has been allowed in the estimate for the recovery value of T. & P. as also of buildings most of which have been provided in pre-fabricated structures.

(Index map showing dam site, etc. is enclosed)

BALWANT SINGH NAG, Project Officer (Kosi).

KOSI PROJECT

Estimate for preliminary surveys and investigations for the Kosi Project for the period, ending March 1950.

	Abs	traci	ŧ									Rs.
1.	Surveys by Survey of India											22,70,000
2.	Surveys under C. W. I. N. C.											37,500
3.	Discharge Observations .								•			80,500
4.	Silt Observations								• .			18,000
5.	Property Surveys								٠.			21,400
6.	Ground Water Surveys .		•							•		Nil
7.	Meteorological Surveys .											2,93,900
8.	Seismological Surveys .		•		•		:					1,14,000
9.	Geological Investigations .	•	•	•	•	•	•	٠			•	12,03,750
10.	Roads and Paths				•					•		1,67,000
11.	Aerial Ropeways			•			•			•		48,000
12.	Soil conservation survey for cont	rollin	g silti	ng oí	Dam	. *						80,000
13.	Agricultural and Soil surveys for	Trrig	ation						•			60,000
14.	Survey of Fish Fauna .										•	5,000
15.	Industrial and Load Surveys						•					5,000
16.	Wooden Models					•						10,000
17.	Temporary accommodation							•				2,70,000
18.	Camp equipage	•	•	•	•	•			•	•		96,000
19.	Tools and Plants new supply		. `									2,33,900
20.	Repairs and carriage to T. & P.	. •		•								60,000
21.	Laboratory at Barakeshtra				•		•		•		•	15,000
									Total			50,88,350
					•				Say			50,88,400
2 2 .	Contingencies on Rs. 50,88,400 at	5%			•				•			2,54,400
23.	Establishment (Salary T. A. and	conti	ngenci	es)	•	•	•		•	•		11,83,000
									Grand Say	Total	:	65,25,800 65,26,000

BALWANT SINGH NAG
Project Officer (Kosi).

Estimate of preliminary surveys and investigations for the period, ending March 1950 $\dot{}$

8. No.	Item	Estimated cost	Total
1	2	3	4
1.	Surveys to be carried out by survey of India under guidance of the C. W. I. N. C.— (a) For fdam Site—	Rs.	Rs.
	Comprising aerial-photography of the gorge and the reserve area, survey and map publication of the dam site to scales a of		
	i. $1=1000$ ii $32''=1$ mile		
	Survey and map publication of the reservoir area and the Chatra gorge to a scale of 4"=1 mile with 20' contour interval and 1" or near scale survey of Dudh Kosi reservois site (in Nepal)	r	
	(b) For irrigation and drainage area to a scale of 4"=1 mile East of Kosi including the river (part area only) 20,00,00 acres, at Re. 1 per acre.	•	
	(c) Cost of various photomosaics, and project maps for detaile study and publication of map-plates and appendices fo the "Project Report".		22,70,00
2.	Surveys to be carried out by or under the direction of the C. W. I. N. Commission.—	*	
-	(a) Longitudinal section of the river and x-sections (1000' apart 50 miles at Rs. 100 per mile	5,000	
	(b) Surveys for railway and road alignments for the dam and the barrage	20,000	
	(c) Alignment of Eastern Kosi Canal and branches: 500 mile at Rs. 25 per mile	12,500	37,5
3.	Discharge Observations.—		
	Number of sites	,	
	Expenditure per site (non-recurring) Rs.		
	Current Meters 1‡ 1,250		
	Boat large 1		
	Boat small 1 600		
	Sounding rods etc		
	Ropes	_	
	3,500	21,000	
	Recurring Expenditure for 2 years per site. Head boatman at Rs. 75 p. m 1,800		
	4 khalasis cum-boatmen at Rs. 60 p.m 5,760		
	Ropes at Rs. 200 per annum 400		
	7,960	-	
	(Say Rs. 8,000) Temporary gauge readers for flood season 24 Nos.	48,000	
	for 4 months per year for two years at Rs. 60 p.m	Say 11,500	80,5
4.	Silt Observations.—		
	Number of sites		
	Recurring expenditure for 2 years: 2 khalasis per site at Rs. 55 p.m. 13,200 Say 13,000		
К	Property Survey.—	18,000	18,0
٠.	For 9 months—		
	4 Surveyors at Rs. 180 p.m 6,480		
	Camp charges 5,000		
	Staff on deputation from Nepal 5,000		
	21,430	Say 21,400	21,4
	en a y a see w		

				Rs.	Rs.
6.	Ground Water Surveys.—				
	These will be done by staff.				N_1l
7.	Meteorological Surveys.—				
	(Figures given by Meteorological Depart Class I Observatories 2 Nos.	ment)			
	Class II Observatories, 2 Nos.	·			
	Class III Observatories , 6 Nos. Class IV Observatories , 20 Nos.	_			
	(a) Non-recurring expenditure.	Rs. 79,700	$\mathbf{Rs.}$		
	(i) Equipment (ii) Installation charges	18,100			
	including buildings .	48,800	1,28,500		
	(b) Recurring charges for two years.	•			
	Pay of Officers	4,800	•		
	$egin{array}{ccccc} \mathbf{Pay} & \mathbf{of} & \mathbf{staff} & . & . & . & . & . & . & . & . & . & $	1,00,000 50,000			
	T. A. & contingencies	10,000	1,64,800	2,93,300	2,93,300
•					
8.	Seismological Surveys.—	. 1 20			
	(Based on figures given by Meteorologic	cai Department			
	(a) Equipment (non-recurring) One Cambridge Universal Vibrogra	ıph			
	One Venner's 12" Accelorograph Two units Milneshaw horizontal	component >	45,000		
	Seismograph One Benioff vertical seismograph	1			
	Six wood-Anderson seismographs		24,000		
	•		69,000		
	(b)Buildings for observatories .		20,000		
	(c) Recurring expenditure for two year	s	_,,,,,,		
	Pay of staff Allowances & Honoraria	13,000 6,000	• •		
	Contingencies	6,000	25,000	1,14,000	1,14,000
_					
9.	. Geological Investigations.— (a) Equipment (non-recurring)				
	Diamond drills 6 Nos	1,80,000			
	Diamonds & spares for above Calyx drill complete	2,40,000 20,000			
	Spares for above Special boats for drills 4 sets.	5,000 10,000			
	Derrick, steel cables etc	5,000			
	Compressors 4 Nos. at 5000 Pumps 2 Nos.	20,000 6,000			
	Hoists for vertical shafts: 2 Nos	10,000			
		4,96,000			
	(b) Labour and consumable stores for	-,00,000			
	(i) 30,000' of diamond drilling				
	at 12 per foot (ii) 2 Vertical shafts for under	3,60,000			
	river tunnel 200' deep				
	each 48" diameter at Rs. 100 a foot	40,000			
	(iii) Cross tunnel under the river 500' at Rs. 100 per				
	foot	50,000			
	(iv) Drifts $7' \times 5'$ length $8000'$ at Rs. 50 per foot .	4,00,000			
	-				
	(c) Specialists.—	8,50,000			
	One drill foreman at Rs. 2000 p.m				
	for 2 years Subsistence allowance for above	48,000			
	at Rs. 584 p.m. = $14,016$	14.000			
	Passage both-ways	14,000 7,500			
	Consulting Geologist's fees .	15,000			
	Resident Geologists 2 Nos. for one year at Rs. 350 p.m.	_			
	Dearness Allowance, T. A. etc.	8,400 3,600			
		96,500		** ** ***	
		80,000		14,42,500	

	Deduct cost of tools and plants detailed below which will be available for use on other works to be taken on stock suspense for further use on other works.	Rs.	Rs.	Rs.
	75% of Rs. 1,80,000, the cost of Rs. drills 1,35,000			
	75% of Rs. 20,000, the cost of calyx drill 15,000			
	Spares			
	75% of Rs. 10,000 the cost of special			
	7,500 75% of Rs. 5,000, the cost of Derrick			
	steel cables 3,750			
	75% of Rs. 20,000, the cost of compressors 15,000			
	75% of Rs. 6,000, the cost of pump 4,500			
	80% of Rs. 10,000 the cost of		9 90 750	10 09 750
	hoists 8,000	-	2,38,750	12,03 ,750
10	Roads and Paths.—			
	(a) Construction—			
	(i) Widening and improving existing path			
	between Barakeshtra and Chatra (ii) Tow Path from Chatra to Dam site right	20,000		
	bank 6 miles	10,000		
	(iii) Foot path from Barakeshtra to Tribeni, left bank	25,000		
	(iv) Foot path from Barakeshtra to Tribeni			
	right bank (v) Foot paths along both banks of the Tamur	17,000		
	from Tribeni to gauge site (vi) Foot path along the Sun Kosi from	4,000		
	Tribeni to gauge site	2,000		
	(vii) Foot path along the Arun from Tribeni to Machwaghat 3 miles	4,000		
	(viii) Improvement of cart track and cons- tructing kutcha road from Chatra to			
	barrage site	20,000		
			1,02,000	
	(b) Maintenance of Roads & Paths-			
	 (b) Maintenance of Roads & Paths— (i) Kutcha road from Jogbani 			
	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra	40,000		
	(i) Kutcha road from Jogbani	40,000 25,000	65,000	1,67 , 00 ₀
11	(i) Kutche road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr	25,000		
	(i) Kutchs road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Art Sun Kosi, 4 Nos. at Rs. 12,000 each	25,000	48,000	48,000
11 12 13	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres	25,000 in and the	48,000 80,000	48,000 80,000
12 13	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres	25,000 in and the	48,000 80,000 60,000	48,000 80,000 60,000
12 13	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna	25,000 in and the	48,000 80,000 60,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey	25,000 in and the	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna	25,000 in and the	48,000 80,000 60,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.—	25,000 in and the	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.—	25,000 in and the	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.—	25,000 in and the	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.—	25,000 m and the	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops	25,000 m and the at 15,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops at Barakeshtra	25,000 m and the at 15,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops at Barakeshtra (iii) Store Shed at Chatra	25,000 m and the at 15,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops at Barakeshtra	25,000 m and the at 15,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops at Barakeshtra (iii) Store Shed at Chatra (iv) Laboratory and Store shed at Bara-	25,000 m and the at 15,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops at Barakeshtra (iv) Laboratory and Store shed at Barakeshtra and Tribeni 2 Nos. (v) M. B. Shed Class IV (vi) Petrol godown	25,000 m and the at 15,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops at Barakeshtra (iii) Store Shed at Chatra (iv) Laboratory and Store shed at Barakeshtra and Tribeni 2 Nos. (v) M. B. Shed Class IV (vi) Petrol godown (vii) Magazine for explosives	25,000 m and the at 15,000 3,500 14,000 11,000 8,000 16,000 1,000 1,000 4,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops at Barakeshtra (iii) Store Shed at Chatra (iv) Laboratory and Store shed at Barakeshtra and Tribeni 2 Nos. (v) M. B. Shed Class IV (vi) Petrol godown (vii) Magazine for explosives (viii) Dispensary building	25,000 m and the at 15,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops at Barakeshtra (iii) Store Shed at Chatra (iv) Laboratory and Store shed at Barakeshtra and Tribeni 2 Nos. (v) M. B. Shed Class IV (vi) Petrol godown (vii) Magazine for explosives (viii) Dispensary building (ix) Office building for Divisional and Sub- Divisional offices	25,000 m and the at 15,000 3,500 14,000 11,000 8,000 16,000 1,000 1,000 4,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Art Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops at Barakeshtra (iii) Store Shed at Chatra (iv) Laboratory and Store shed at Barakeshtra and Tribeni 2 Nos. (v) M. B. Shed Class IV (vi) Petrol godown (vii) Magazine for explosives (viii) Dispensary building (ix) Office building for Divisional and Sub-	25,000 m and the at 15,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops at Barakeshtra (iii) Store Shed at Chatra (iv) Laboratory and Store shed at Barakeshtra and Tribeni 2 Nos. (v) M. B. Shed Class IV (vi) Petrol godown (vii) Magazine for explosives (viii) Dispensary building (ia) Office building for Divisional and Sub- Divisional offices (x) Sheds for skilled and unskilled labour 200 No. (xi) Sheds for cooking meals for the above	25,000 m and the at 15,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000
12 13 14 15 16	(i) Kutcha road from Jogbani to Chatra 40 miles and Chatra to barrage site 16 miles (ii) All other foot paths Aerial ropeway across the Sapt Kosi, the Tamur, the Arr Sun Kosi, 4 Nos. at Rs. 12,000 each Soil Conservation Surveys Agricultural and soil survey for irrigation 4 million acres per million acres Survey of Fish Fauna Industrial and Load Survey Wooden models Temporary Accommodation.— (a) Dam Investigation.— Non-Residential.— Administrative Quarters at Barakeshtra (i) Inspection Houses at Barakeshtra and Jogbani at 7,000 each (ii) M. B. Sheds for stores and workshops at Barakeshtra (iii) Store Shed at Chatra (iv) Laboratory and Store shed at Barakeshtra and Tribeni 2 Nos. (v) M. B. Shed Class IV (vi) Petrol godown (vii) Magazine for explosives (viii) Dispensary building (ix) Office building for Divisional and Sub- Divisional offices (x) Sheds for skilled and unskilled labour 200 No.	25,000 m and the at 15,000 8,500 14,000 11,000 8,000 16,000 10,000 1,000 4,000 3,000 18,000	48,000 80,000 60,000 5,000 5,000	48,000 80,000 60,000 5,000

Residential—	Rs.	Rs.	Rs.
(2) Executive Engineer's Bungalow	6,000	1,001	105.
(ii) Residences for six gazetted officers (3	0,000		
S. D. Os., 2 Geologists and 1 Meteorolo-			
gist)	18,000		
(iii) Accommodation for clerks, drawing			
staff storekeepers, compounders and laboratory assistants 25 Nos.	25,000		
(iv) Accommodation for supervisors, Silt	•		
Analyst, Research Assistant: 25 Nos.	40,000		
(v) Drill Foreman's quarter: 1 No	5,000		
(vi) S. D. Os. visiting quarter at Tribeni.	1,500		
(vii) Time Keepers, gauge readers, Daffadars,			
Barkandazes, Peons, Chowkidars, Dak runners, Boatmen, Nepalese guards,			
Sweepers' quarters at Rs. 350 each 80	22.000		
Nos.	28,000		
(viii) Servants quarters at camp sites:	1,500		
-			
(b) Irrigation and Drainage investigations.—	1,25,000	1,25,000	
Accommodation for officers and stores sheds			
etc. L. S. 50,000 for each division 2			
Nos		1,00,000	
•		3,47,500	
Deduct the cost of materials from pre- fabricated structure like M. B. Sheds,			
Lahore Sheds Nissen Sheds which will be			
available for use on other Projects to be			
taken on stock suspense and credited to this work		77,000	
18 Camp Equipage.—		2,70,000	2,70,000
(i) For Dam Division.—			
4 Tents 14'× 14'@ 1,400	5,600	`	
12 Tents 10'× 10' @ 800 ,	9,600		
6 necessary tents @ 150	900		
30 shouldaries @ 350	10,500		
Camp furniture	7,500		
Repairs and carriage of furniture	5,000	39,100	
(ii) For Irrigation Divisions.—			
4 Tents 14'× 14' @ 1,400	5,600		
8 tents $12' \times 12'$ @ 1,100	8,800		
15 tents 10'× 10' @ 800	12,000		
30 shouldaries @ 350	10,500		
Camp furniture	10,000		
Repairs and carriage of Camp equipage .	10,000	56,900	96,000
10 Maria and Direct			
19 Tools and Plant.— (i) Special Tools.—			
For Kosi Dam Division.—			
Jeeps with Trailers 2 Nos. @ 6,000	*000		
Weapon carrier trucks 6 Nos. @ 6,000 .	12,000*		
G. M. C. Trucks 4 Nos. @ 10,000	36,000* 40,000*		
Country boats 18 Nos. @ 1,000	18,000		
Inspection boats 4 Nos. @ 1,200	4,800*		
Motor boats 2 Nos. @ 8,000	16,090*		
For Irrigation Division.—	44,000		
Jeeps and trucks 2 Nos. @ 6,000	12,000*		
Weapon carriers 8 Nos. @ 6,000	48,000*		
Boats 8 Nos. @ 1,000	8,000		
(ii) Instruments.—			
For Kosi Dam Division.—	•		
Levels 12 Nos. @1,000	12,000**		
Theodolites 3 Nos. @ 3,500	10,500**		
Binoculars 4 Nos. @ 200	**008		
Cameras 2 Nos. at 400	800**		
Miscellaneous Surveying and Drawing Instru- ments	5,000		
	0,000		

	For Kosi Irrigation Divisions.—	Rs.	Rs.	Rs.
	Levels 24 Nos. at 1,000	24,000**		
	Theodolites 6 Nos. at 3,500	21,000**		
	Other surveying and drawing instruments	10,000		
	Soil testing and Laboratory equipment .	10,000		
	(iii) Office Fur niture and other T. & P.—			
	For Kosi Dam Division.—			
	Office furniture for Executive Engineer and S. D. O's.	6,000		
	For Kosi Irrigation Divisions.—	0,000		
	Miscellaneous T. P at 10,000 per Divi-			
	sion	20,000		
	Office furniture for Executive Engineer and Sub. Division Officers	12,000	3,26,900	
	Deduct cost of stores likely to be available for use on other works and projects after completion			
	of the investigation to be taken on stock			
	suspence and cost to be credited to this			
	work as under :	42,000		
	25% of the cost of items marked * pre-page 75% of the cost of items marked ** above	51,000		
	75 /0 Of the cost of feeling marked above		93,000	2,33,900
20	Repairs and Carriage of vehicles	60,000	60,000	
21	Silt and chemical laboratory at Barakeshtra .	15,000	15,000	
22	Contingencies at 5% on the amount of Rs. 50,88,400	2,54,400	2,54,400	
23	Establishment.—			
	(i) Kosi Dam Investigation Division.—			
	1 Executive Engineer for 3 years @ 1,150 p.m.	41,400		
	3 Asstt. Engineers for 3 years @ 350 p.m	37,800		
	15 Supervisors for 3 years @ 150/-p.m.	81,000		
	1 Accountant for 3 years @ 235/-p.m.	8,460		
	1 Head Clerk for 3 years @ 170/-p.m	6,120		
	3 Sub Divisional Clerks for 3 years @ 80/-p,m.	8,640		
	1 Accounts Clerk for 3 years @ 100/-p.m	3,600		
	4 Clerks for 3 years @ 55/-p.m.	7,920		
	6 Clerks for 2 years @ 55/-p.m	7,920		
	1 Sr. Draftsman for 3 years @ 150/-p.m.	5,400		
	1 Jr. Draftsman for 3 years @ 140/-p.m.	5,040		
	1 Tracer for 2 years @ 60/-p.m	1,440		
	1 Ferro Printer for 2 years @ 60/-p.m	1,440		
	1 Civil Asstt. Surgeon for 3 years @ 370/-p.m. 1 Compounder for 3 years @ 60/-p.m.	13,320 2,160		
	1 Research Asstt. for 3 years @ 160/-p.m	5,760		
	3 Silt Analysts for 3 years @ 100/-p.m.	10,800		
	1 Silt Analyst for 2 years @ 100/-p.m.	2,400		
	1 Laboratory Asstt. for 2 years @ 60/-p.m	1,440		
	1 Laboratory Attendant for 2 years @ 40/-p.m.	. 960		
	1 Seismological Asstt. for 1 year @ 160/-p.m.	1,920		
	1 Senior observer for 1 year @ 100/-p.m.	1,200		
	1 Junior observer for 1 year @ 60/-p.m	720		
	6 Guage Readers for 3 years @ 35/-p.m	7,560		
	4 Deffadars for 3 years @ 30/-p.m	4,320		
	6 Barkandazes for 3 years @ 30/-p.m.	6,480		
	8 Peons for 3 years @ 30/-p.m	8,640		
	7 Nepalese Police Guards for 3 years @ 35/-p.m.	8,820		
	1 Dispensary servant for 3 years @ 30/-p.m.	1,080		
	2 Storekeepers for 2 years @ 80/-p.m.	3,840		
	4 Special pay for handling cash for 3 years	2.55		
	at 20/-p.m.	2,880		
	Add provision for increments	10,000	3,10,480	
			,,	
	(ii) Irrigation and Drainage Investigation Divisions.			
	2 Exec. Engineers for 2 years @ 1,000/-p.m.	48,000		
	6 Asstt. Engineers for 2 years @ 350/-p.m.	50,400		
	20 Supervisors for 2 years @ 150/-p.m	72,000		
	2 Accountants for 2 years @ 200/-p.m.	9,600		
	2 Head Clerks for 2 years @ 160./-p.m.	7,680		

		Accounts				@	100/-	p.m		
		Sub-Divi		_	3	@	80/-	$\mathbf{p.m}$		
		Asstt. Cl		•		@	55/-	p.m	. 21,120	
		Storekeep				@	80/-	p.m	. 3,840	
	1	Sr. Draft	sman for	2 years		@	150/-	p.m.	3,600	
	2	Jr. Draft	sman for	2 years		@	100/-	p.m	4,800	
	2	Tracers f	or 2 years	3		@	60/-	p.m.	2,880	
	2	Ferroprin	iters for	years		@	60/-	p.m.	2,880	
	6	Guage R	eaders for	r 2 year	s	@	35/-	p.m.		
	8	Daffadar	s for 2 ye	ars		@	30/-	p.m		
	24	Barkand	azes for 2	years		@	30/-	p.m		
		Peons fo				@	30/-	p.m.		
		Asstt. So	•	st for 1	vear	_	350/-	p.m		
		Soil Ana	_		•	@	100/-	p.m	7.4.400	
		Peon for	7			@	30/-	p.m		
		Special p	-	andling	cash	_				
	Ĭ	at 20/-p,					y caza		3,840	
	A	dd provis	ion for in	cremen	ts for	1 ye	ear		20,000	
										3,29,120
	(iii) I	Direction C	ffice.—							
		Stenogra		2 veers		@]	170/-	p.m.	4,080	
		Superint	_	-	*02	_	250/-	_	6,000	
		Circle Cle		•		~	160/-	p.m.	3,840	
		Upper Da		-		_	30/-	p.m.	5,760	
		Lower	•		-	~	•	p.m.	•	
		Sr. Draft	,, emen for	yea		@	55/- 150/-	p.m.		
		Jr. Draft		-		@	'.	p.m.		
		Tracer fo		-		_	100/-	p.m.		
		Ferroprin	•		•	@	60/-	p.m.		
		Daftri for		years		@	60/-	p.m.		
		Peons for	•		•	@	35/-	p.m.	840	
		Barkand	•			@	30/-	p.m.		
		Special 3			anah	@ for ?	30/-	$\mathbf{p}.\mathbf{m}$. 720	
	•	at 20/- p		sugning	casii.	101 2	years		480	
	A	dd provis	_	creame	nts				2,200	
	(A) D		1 NT . 1 4	~		**				•
	(6) De	arness an	d Mepal	Compen	satory	y allo	wances	3.]		42,4(0
s. N		lass of Es			NT -	Th			3.T 1	
PO. TA	· ·	TASS OI LE	su 0.	•	No.	in 3	d D.	A.	Nepal Allce.	
1	Executive I	Indineer			7	9	Re		Rs.	
-	Executive	-		•	1 2	3 2	4,1 4,8		5,400	
2	Asstt. Engi	•	,	•	3	3	•	60	• • • • • • • • • • • • • • • • • • •	
_	wronger milks	HOOLS	•	•	6	2	10,8		8,100 1,800	
3	Supervisors				15	3	24,8		21,600	
	_				20	2	19,2		3,000	
4	Assountant	s			1	3	1,8		1,080	
					2	2	2,1		-,000	
5	Circle Supd	t.		•	1	2		00	••	
6	Circle 2nd			•	1	2	1,0		••	
7	Head Clerk			•	1	3	1,6		1,080	
8	Accounts of				1	3	1,2		900	
9	Head Clerk		. ,		2	2	2,1		4.	
10	Accounts of			-	.2	2	1,6		••	
11	Upper Div.			-	3	2	2, 5			
12	Sub- Div. (•	3	3	_	780	2,160	
			•	-	6	2	-	40	480	
13	Steno for P	roject off	ger	_	1	3		20	***	
14	Clerks .	.,		_	4	3		40	2.880	
		•	- •	•	26	2	21,8		3,360	
T =	e					_				

4 3 26 2 4 2 1 3

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3,300 1,440

960

1,440

3,380 3,360 1,440

1,080

1,080

430

480

S. No.

20	Civil Asstt. Surgeon			1	3	2,520	2,700		
21	Compounder			1	3	1,260	720	-	
22	Dispensary Servant			1	3	900	360		
23	Research Asstt			1	3	1,620	1,440		
24	Silt Analysts	•	•	3 1	3 2	3,780 840	2,700 600		
25	Asstt. Soil Specialist			1	2	1,680			
26	Soil Analysts .			6	2	5,040	600		
27	Laboratory Asstt			1	2	840	480		
28	Laboratory Attendant.			1	2	600	240		
29	Seismological Asstt.			1	1	540	48Ò		
30	Sr. Observer .			1	1	420	300		
31	Jr. Observer			1	1	420	240		
32	Guage Readers .			6	3	5,400	2,160		
33	Daffadars			6	2	3,600	480		
				4	3	3,600	1,440		
				8	2	4,800	240		
34	Barkandazes			6	3	5,400	2,160		
				25	2	15,000	720		
35	Peons			8	3	7,200	2,880		
				22	2	13,200	240		
36	Daftri			1	2	600			
37	Peon	•	•	1	1	300	••		
						2,17,080	77,580	2,94,660	9,76,660 Say 9,77,000
	(c) Travelling Allow							•	
	(i) For Kosi I year for 3 ye	ars	•	•			33,000		
	(ii) For 2 Irriging (ii) For 2 Irriging (ii) for 2 years	gation ions (and 0 11,0	Drain 000 ea	age l	Investi- er year	44,000		
	(iii) For supditg. I 4,000 per ye	Engin ar for	eers Ca	amps	taff e		8,000	85,000	85,000
	(d) Contingencies.—							•	
	(i) For Dam I year for 3 year	nvest		90 000					
	(ii) For 2 In		estion	2.000	39,000				
	each per yea	r for	2 year	s		.3,000	52,000		
	(iii) For Director 2 years	tion (JHICO	15,00	· per	year .	30,000	1,21,000	1,21,000
		Tota	11,83,000						

BALWANT SINGH NAG Project Office: (Kosi).

APPENDIX III.

MINISTRY OF WORKS, MINES AND POWER.

One of the factors governing the attitude of the S. F. C. to River Valley Projects is the high cost of preliminary investigations. Considering the difficulties of transport and the availability of steel and cement, I do not think that Government would be able to undertake a large number of river valley projects within a measurable period. Government are already committed to the Damodar Project as a whole, the Hirakud Dam Project, the Bhakra and Nangal Projects, Rihand, Tungabhadra and Ramapadasagara to mention only a few of the prominent projects which must go ahead in any case. The Kosi Project on which we have already spent a large amount on preliminary investigations must also go ahead. Similar considerations would seem to apply to some of the dams on the Chambal, the Narbada and the Tapti. These projects will tax all our resources and the capacity of CWINC to the utmost for the next 5 years, if not for a longer In the circumstances, I am of opinion that CWINC should try and reduce the cost of preliminary surveys on all other projects which are now under contemplation, e.g., projects in the Assam Valley, in the C. P., Coorg and so on. It is quite unnecessary at this stage to undertake aerial survey of all these projects, nor does it seem worthwhile taking up a large number of such projects even for preliminary investigations. should pick and choose and only take up projects which appear most likely to be profitable and concentrate our energies on such projects. For instance, it will not be possible for many years to utilize all the electrical potential in Assam. The utmost we can aim at is to build one large dam at a suitable site in Assam which will provide power and irrigation. A very rough investigation of the various projects in view will suggest which of them should be taken up for preliminary investigations; similarly in the ('entral Provinces and other areas. Even on the Mahanadi, I am inclined to think that we should not spend any more money on the third site, viz., Naraj. It will be quite enough if Tikkarpars site is explored. The investigations on the third site may well be undertaken 10 years hence, after Hirakud and Tikkarpara are nearing completion.

2. I have put down my tentative views as a basis for discussion with Mr. Khosla. If he agrees with me, will he kindly reduce his estimates for preliminary investigations "A" of the Narbada-Tapti, Assam Valley, and other schemes before the next meeting of the S.F.C. I do not want the investigations on the Kosi to be curtailed nor on any other projects which are likely to be actually constructed during the next 5 years. But there is no point in spending large sums of money on other investigations which are not likely to be fruitful, at least for the next 5 or 7 years.

Sd. B. K. GOKHALE, 4-3-48. (Secretary)

Mr. Khosla D. S. P).

I am in complete agreement with Secretary's views. Will Members and Directors note above and take immediate action as to "A" above in consultation with me so that I can discuss this with Secretary on Monday or Tuesday before I go on tour. This note should come back to me for return to Secy.

Sd. A. N. KHOSLA, 4-3-48. (Chairman, CWINC.)

APPENDIX IV.

NARBADA VALLEY PROJECTS.

REPORT

The Narbada river has hitherto been considered as useless for being exploited for either irrigation, power, or navigation, the latter beyond a certain small distance above its outfall into the Gulf of Cambay. In its course through the Broach district of the Bombay Presidency it frequently overflows its banks and floods the country-side on both banks. This fact as well as the projected development of other river basins in the country led the Governments of Bombay and C. P. Berar to request the CWINC to take up the investigations for a basin-wide development of the river with flood control, irrigation, power generation and extension of navigation as the chief objectives in view. They offered to depute some of the Engineering staff necessary for the work and also bear the cost of investigations in case no projects matured.

Accordingly the topography and hydrology of the basin were taken up for study in the CWINC at the beginning of the year 1947. The river drains an area of nearly 40,000 sq. miles. The total annual precipitation of rain in the basin is normally over 90 million acre feet of water. At present the entire amount is running to waste into the sea. The river has a deep channel almost throughout its course except in the plains of Broach after it emerges from the last narrow gorge near Rajpipla. The bed slopes vary from a maximum of about 40 feet a mile to about 3.75 ft. a mile through the last gorge. In the Broach plains it flattens out to about 2½ to 3 inches per mile. Almost throughout its course it flows over basaltic formations.

A study of the topography has revealed that excellent storage sites exist both on the main river and on some of its tributaries where, by constructing dams of medium heights, reservoirs of varying capacities can be formed to hold back the excessive precipitation of rain during monsoon months and utilize the water for purposes of perennial irrigation, power generation, extension of navigation, fish culture and supplies for domestic uses all over the basin. Floods in the Broach area can be completely controlled by reserving the upper portion of their capacities for flood absorption in some of the lower reservoirs.

Most of these sites have been inspected both by Engineers and Geologists and the preliminary ground surveys have revealed that development of projects at the sites is feasible. It has been decided to take up, for the present, investigations of only The last two items of the list show the power 7 projects, a list of which is appended. and irrigation potential of the projects, which will aggregate to nearly one million k.w. of continuous power and a gross command of nearly 4 million acres respectively. estimate amounting to Rs. 95,91,144 has been prepared to meet the cost of detailed investigations of these projects. Provisions have been made for collection of hydrological data including rainfall, temperature, and humidity and river gauging; surveys of dam sites, the reservoir areas and areas to be commanded for irrigation; soil surveys of the commanded area and geological surveys of the dam sites. Such other surveys as minerals of the entire basin, electrical load surveys, surveys for navigation, soil erosion and also economic surveys by Gokhale Economic Research Institute, Poona, have also been included in the programme of investigations and requisite provisions made in the estimate. Surveys of dam sites reservoir areas and irrigation areas will be done through the agency of the Survey of India Department, while surveys of main canals and other channel alignments for distribution system for irrigation water will be done by CWINC staff. The hydrological surveys will be undertaken in close cooperation with the Indian Meteorological Department. Geological surveys both for minerals and foundation explorations will be done in close co-operation with the Geological Survey of India. Similarly surveys for pisciculture will be undertaken under the direction of the Director, Zoological Survey of India.

Two divisions have been formed to do the work. Each Division will have four subdivisions together with requisite subordinate and ministerial staff. Such other staff as meteorological assistants, Research Assistants for soil survey, Silt Observers, Geologists, Drill foreman etc. has also been provided for, as detailed in the estimate

The work will take nearly four years to complete. But the investigations will be so phased that construction can be launched upon in case of features which can be taken up independently before the investigations on all projects are completed so as to obtain quick and maximum results. As soon as such stages are reached, estimates for construction will be prepared for sanction.

Adequate provision for acquiring necessary tools and plant and transport vehicles has been made at rates which prevail in the market at present.

A statement showing the rough data for the dam sites and the anticipated benefits from the projects is given below.

The following map and chart are enclosed:—

- (1) An index map of the Narbada basin showing the proposed dam sites and projects
- 2) A profile of Narbada river and its main tributaries.

G. N. PANDIT, Project Officer (Narbada and Tapti).

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NARBADA BASIN—ROUGH DATA FOR THE DAM SITES

1. Name of the river .	Narbada	Burhner	Narbada	Tawa	Narbada	Narbada	Narbada
	Bilghara	Ghugu	Bargr	Rampur	Punasa	Barwani	Weir below gorge
3. Length along river (Miles)	153	85	249	95	513 -	665	750 (approx.)
4. Latitude and Longitude of dam site	80°29′20″E				76°28′0″E 22°17′0″N		
5. Catchment area above dam site (Sq. miles) .	1900	1290	6180	2340	2360	32000	
6. Average rainfall in catchment (Inches) .	60	60	55	59	45	42	
7. Probable mean annual runoff (m. a. ft.)	3.06	2.06	4.8	3 · 12	15.63	22.23	
8 R. L. of river bed .	1520	1570	1240	1020	650	350	
9. Proposed F. T. L.	1750	1745	1350	1190	887	590	
10. Maximum height of the dam at F. T. L. (feet) .	230	175	110	170	237	240	
11. Length of the dam at F. T. L. (feet)	3960	5300	5120	2700	2400	2000	
12. Gross capacity of reser voir at F. T. L. (m.a.ft.).	1.90	1.57	2.59	5.0	17:1	£ 25·18	
13. Dead storage (m.a.ft) .	0.19	0.13	0.29	1.5	1.52	2.35	
14. Max. area of water spread (acres)	22900	32000	62200	89600	320000	390400	
15. Losses due to evapora- tion (m.a.ft.)	0.08	0.10	0.25	0.36	1.03	1 23	
16. Reserve for flood control	• •	••	••	• •	• •	• •	
17. Net storage available .	1.63	1.34	2.05	3.14	14.60	21.00	
18. Continuous regulated discharge (cusecs)	3275	2380	9700	4140	20500	28980	
19. R. L. of the top of dead storage	1613	1638	1308	1147	790	470	
20. R. L. of tail race	1540	1585	1280	1125	670	375	
21. Average head available (feet)	9 141·5	106.5	50	47	168 · 5	155	
22. Continuous power available k. w.	. 3 0800	17500	32500	12700	223000	300000	
23. Gross area commanded (acres)		••	18,00,000	11,00,000	••		8,00,000
4-							

I.—Total live storage impounded . . 31 ·13 m. a. ft. Total gross area commanded 37,00,000 acres

II.—Continuous power generable Bilghara 30,800 K.W.

17,500 ,, Ghugri Bargi 32,500 " Tawa 12,700

Punasa 223,000

At the dam between Punasa and Harinphal 112,000 Harinphal 250,000

. 320,000 At the two dams in the gorge . 9,98,500 Total

> G. N. PANDIT, Project Officer (Narbada and Tapti.)

NARBADA PROJECTS ESTIMATES

Overall estimate for preliminary surveys and investigations in connection with projects for the multipurpose development of the Narbada Basin.

T . 9 .	ets for the i	-	_		_	_							
	I. WORKS				A	.bstra	ict						Rs.
1.	Dams and Ap			KS.									*8,74,000
	A. Prelimin		enses	•	•	•	•	•	•	•	•	•	1,00,000
_	K. Building	_		•	•	•	•	•	•	•	•	•	• •
2.	Main canal a			•	•	•	•	•	•	•	•	•	45,46,500
3.	Discharge and			ns	•	•	•	•	•	•	•	•	2,00,000
4.	Meteorologica		zations	•	•	•	•	•	•	•	•	•	25,800
5.	Mineral surve	-	•	•	•	•	•	•	•	•	•	•	10,000
6.	Surveys for P		ue.	•	•	•	•	•	•	•	•	•	2,000
7.	Malaria surve	•	•	•	•	•	•	•	•	•	•	•	5,000
8.	Electric Load	-		•	•	•	•	•	•	•	•	•	10,000
9.	Surveys for N	_		•	•	•	•	•	•	•	•	•	1,00,000
10.	Economic an		-	eys	•	•	•	•	•	•	•	•	60,000
11.	Soil erosion s	-	• •	•	•	•	•	•	•	•	•	•	7,500
12.	Communicati		•	•	•	•	•	•	•	•	•	•	3,00,000
13	Special Tools	and Pla	int	•	•	•	•	•	•	•	•	•	4,60,000
													67,00,800
	2 per cent. C	o nt ınger	icies .										1,34,016
	_	_						m-L-	. 1 117.	1			60 24 016
	II. TOOLS A	ND PT	ANT					TOTE	al Wo	rks	•	•	68,34,816
	Tools and Pla									_			4,38,000
	2 per cent. C				·	•	•	•	•	•			8,760
	- por contro	0200		•	•	•		. •	•		•	•	
							Tota	l Tool	s and	Plan	t.	•	4,46,760
	III. ESTABI												120.00 KG/I
E	stablishment fo	or 4 year	s includ	ing es	tablish	men	t cont	ingeno	cies	•	•	•	23,09,568
			•					G	rand	Total	١.		95,91,144
	# 1170D170					n	1						
	I. WORKS					Det	ails						
1		of rese	rvoir k	A. basin		air j	phot	ograp	ohy :	and	grour	ıd sı	urvey and plotting
conto	l. Survey o	of rese	rvoir k	A. basin	s by	air j	phot	ograp	ohy :	and			
conto	1. Survey o ours at 10 ft Ghugri Dam	of rese	rvoir k	A. basin	s by	air j	phot	ograp	ohy :	and	50	1	sq. miles
conto 1. 2.	1. Survey ours at 10 ft Ghugri Dam Blghra.	of rese	rvoir k	A. basin	s by	air j	phot	ograp	ohy :	and	50 25	· 8•8	sq. miles
conto 1. 2. 3.	1. Survey ours at 10 ft Ghugri Dam Blghra. Bargi .	of rese	rvoir k	A. basin	s by	air j	phot	ograp	ohy :	and	50 28 97	·8	sq. miles
conto 1. 2. 3.	1. Survey ours at 10 ft Ghugri Dam Blghra. Bargi . Tawa .	of reserve	rvoir k	A. basin	s by	air j	phot	ograp	ohy :	and	50 28 97 139	· 8	sq. miles
conto 1. 2. 3. 4.	1. Survey ours at 10 ft Ghugri Dam Blighra. Bargi Tawa Hoshangaba	of reserve	rvoir k	A. basin	s by	air j	phot	ograp	ohy :	and	50 25 97 139 25	6 (Ap	sq. miles ,, ,, prox.)
conto 1. 2. 3. 4. 5.	1. Survey of the Ghugri Dam Bilghra. Bargi . Tawa . Hoshangaba	of reserve	rvoir k	A. basin	s by	air j	phot	ograp	ohy :	and	50 25 97 139 25	: *8 : : (Ap	sq. miles ,, ,, prox.)
1. 2. 3. 4. 5.	1. Survey ours at 10 ft Ghugri Dam Blighra. Bargi Tawa Hoshangaba Punasa Harinphal	of reserve	rvoir k . inter	A. basin vals	s by on a	air j scal	phot	ograp	ohy :	and	50 25 97 139 25 500 14	6 *8 (Ap	sq. miles ,, ,, prox.) ,,
1. 2. 3. 4. 5. 6.	1. Survey ours at 10 ft Ghugri Dam Blighra. Bargi Tawa Hoshangaba Punasa Harinphal Dam site bet	of reserve	rvoir k . inter	A. basin vals	s by on a	air j scal	phot	ograp	ohy :	and	50 25 97 139 25 500 14	6 * 8 6 (Ap	sq. miles ,, ,, prox.) ,,
1. 2. 3. 4. 5. 6.	1. Survey ours at 10 ft Ghugri Dam Blighra. Bargi Tawa Hoshangaba Punasa Harinphal	of reserve	rvoir k . inter	A. basin vals	s by on a	air j scal	phot	ograp	ohy :	and	50 25 97 139 25 500 14 2	6 · 8 6 · (Ap) 7 · (Ap) 9 · (D)	sq. miles ,, ,, prox.) ,, ,,
1. 2. 3. 4. 5. 6.	1. Survey ours at 10 ft Ghugri Dam Blighra. Bargi Tawa Hoshangaba Punasa Harinphal Dam site bet	of reserve	rvoir k . inter	A. basin vals	s by on a	air j scal	phot	ograp	ohy :	and	50 28 97 139 25 500 14 2 1	(Ap	sq. miles ,, ,, prox.) ,,
1. 2. 3. 4. 5. 6.	1. Survey of Durs at 10 ft Ghugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet	of reserved	rvoir k . inter	A. basing vals	s by on a	air j scal	phot	ograp	ohy mil	and	50 25 97 139 25 500 14 2 1	(Ap	sq. miles ,, ,, prox.) ,, ,,
1. 2. 3. 4. 5. 6. 7. 8.	I. Survey of Durs at 10 ft Ghugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites	of reserved	rvoir k . inter	A. basin vals	s by on a	air j scal	photo e of	ograp 4"—1	ohy mil	and	50 25 97 139 25 500 14 2 1 103	(Ap	sq. miles ,, ,, ,, prox.) ,, ,, ,,
conto 1. 2. 3. 4. 5. 6. 7. 8.	1. Survey of the Chugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey	of reserved	rvoir k inter inter inasa an pla gorg	A. basin vals	s by on a	air ; scal	photo e of	ograp 4"—1	ohy mil	and	50 25 97 139 25 500 14 2 1 103	(Ap	sq. miles ,, ,, prox.) ,, ,,
conto 1. 2. 3. 4. 5. 6. 7. 8.	1. Survey ours at 10 ft Ghugri Dam Bilghra. Bargi Tawa Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on	of reserved	rvoir k . inter	A. basin vals	s by on a	air ; scal	photo e of	ograp 4"—1	ohy mil	and	50 25 97 139 25 500 14 2 1 103	(Ap	sq. miles ,, ,, ,, prox.) ,, ,, ,,
conto 1. 2. 3. 4. 5. 6. 7. 8.	1. Survey of the Chugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a	of reserved	rvoir k inter inasa an pla gorg Rs. 375; n sites e of 3 per acre	A. basin vals	s by on a	air ; scal	phote e of	rapperare of the second	phy mil	and e.	500 28 97 138 25 500 144 2 1 103 00.	(Ap.	sq. miles "" prox.) "" "" "" d ground surveys
conto 1. 2. 3. 4. 5. 6. 7. 8. 9.	1. Survey of the Chugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic	of reset. —5 ft. d ween Pu in Rajpi niles at I of Dar a scale at Rs. 4	rvoir k inter inter nasa an pla gorg Rs. 375; e of 3 per acre estigat	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 97 139 25 500 144 2 1 103 00. raphy	(Ap)	sq. miles "" "" prox.) "" "" "" d ground surveys Weir sites and of
conto 1. 2. 3. 4. 5. 6. 7. 8. 9.	1. Survey of the Chugri Dam Bulghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic reservoir bar	of reset in the second of the	rvoir k inter inter masa an pla gorg Rs. 375; m sites e of 3 per acre estigat borir	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 97 139 25 500 144 2 1 103 00. raphy	(Ap)	sq. miles ,, ,, ,, prox.) ,, ,, ,,
conto 1. 2. 3. 4. 5. 6. 7. 8. 9.	1. Survey of the Chugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic	of reset in the second of the	rvoir k inter inter masa an pla gorg Rs. 375; m sites e of 3 per acre estigat borir	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 97 139 25 500 144 2 1 103 00. raphy	(Ap)	sq. miles "" "" prox.) "" "" "" d ground surveys Weir sites and of
conto 1. 2. 3. 4. 5. 6. 7. 8. 9.	1. Survey of the Chugri Dam Bulghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic reservoir bar	of reset in the second of the	rvoir k inter inter masa an pla gorg Rs. 375; m sites e of 3 per acre estigat borir	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 500 14 2 103 500. raphy	(Ap)	sq. miles "" "" "" "" "" "" "" "" "" "" "" "" "
conto 1. 2. 3. 4. 5. 6. 7. 8. 9. and	1. Survey ours at 10 ft Ghugri Dam Bulghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic reservoir batesting. N	of reset in the second of the	rvoir k inter inter masa an pla gorg Rs. 375; m sites e of 3 per acre estigat borir	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 500 14 2 103 500. raphy	(Ap.) (Ap.) 55 56 an	sq. miles "" "" "" "" "" "" "" "" "" "" "" "" "
conto 1. 2. 3. 4. 5. 6. 7. 8. 9. the ring	1. Survey of the control of the cont	of reset in the second of the	rvoir k inter inter masa an pla gorg Rs. 375; m sites e of 3 per acre estigat borir	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	50 28 97 139 25 500 14 2 1 103 00. raphy	(Ap.) (Ap.) 55 55 an and sunn	sq. miles "" "" "" "" "" "" "" "" "" "" "" "" "
conto 1. 2. 3. 4. 5. 6. 7. 8. 9. the 1 ing	1. Survey of the Chugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic reservoir battesting. No Silghara .	of reset in the second of the	rvoir k inter inter masa an pla gorg Rs. 375; m sites e of 3 per acre estigat borir	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 97 138 25 500 144 2 1 103 00. raphy sites 8 and 1	(Ap.) (Ap.) (55 55 6 1.8 and sunn	sq. miles "" "" "" "" "" "" "" "" "" "" "" "" "
conto 1. 2. 3. 4. 5. 6. 7. 8. 9. the ring	1. Survey of the Chugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic reservoir battesting. No Silghara . Shugri Sargi	of reset in the second of the	rvoir k inter inter masa an pla gorg Rs. 375; m sites e of 3 per acre estigat borir	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 97 139 25 500 144 2 1 103 00. raphy sites 3 and 4 40 56 52 30	(Ap. (Ap. 1) 55 55 in and sunn Nos.	sq. miles "" "" "" "" "" "" "" "" "" "" "" "" "
conto 1. 2. 3. 4. 5. 6. 7. 8. 9. the ring	1. Survey of the Chugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic reservoir battesting. No Silghara . Shugri .	of reset in the second of the	rvoir k inter inter masa an pla gorg Rs. 375; m sites e of 3 per acre estigat borir	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 97 139 25 500 144 2 1 103 00. raphy sites 3 and 4 56 52 30	(Ap. 1.8 and sunn	sq. miles "" "" "" "" "" "" "" "" "" "" "" "" "
conto 1. 2. 3. 4. 5. 6. 7. 8. 9. the 1 ing	1. Survey of the Chugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic reservoir battesting. No Bilghara . Sargi . Sargi .	of reset in the second of the	rvoir k inter inter masa an pla gorg Rs. 375; m sites e of 3 per acre estigat borir	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 97 139 25 500 144 2 1 103 300. raphy sites 3 and 4 56 52 30 100 20	(Ap. 1.8 and sunn	sq. miles "" "" "" "" "" "" "" "" "" "" "" "" "
conto 1. 2. 3. 4. 5. 6. 7. 8. 9. the 1 ing	1. Survey of the Chugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic reservoir battesting . No silghara . Silghara . Sargi .	of reserved	nasa an pla gorge e of 3 per acre estigat y borir ores	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 97 139 25 500 14 2 1 103 300. raphy sites 3 and 4 56 52 30 100 20 32	(Ap	sq. miles "" "" "" "" "" "" "" "" "" "" "" "" "
conto 1. 2. 3. 4. 5. 6. 7. 8. 9. the 1 ing	1. Survey ours at 10 ft Ghugri Dam Bulghra. Bargi Tawa Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic reservoir bat testing. N 3silghara Hugri Bargi Bargi Bargi Bargi Bargi Bargi Bargi Barga Bargi Bargi Barga	of reserved	nasa an pla gorge e of 3 per acre estigat y borir ores	A. basin vals	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 97 139 25 500 144 2 1 103 300. raphy sites 3 and 4 56 52 30 100 20 32 27	(Ap)	sq. miles "" "" "" "" "" "" "" "" "" "" "" "" "
conto 1. 2. 3. 4. 5. 6. 7. 8. 9. the 1 ing 1	1. Survey of the Chugri Dam Bilghra. Bargi . Tawa . Hoshangaba Punasa Harinphal Dam site bet 2 Dam sites 1031.8 S. n 2. Survey plotting on 7500 acres a 3. Geologic reservoir battesting . No silghara . Silghara . Sargi .	of reserved	rvoir k inter inter inasa an pla gorg as 375; m sites e of 3 per acre estigat borir ores sa and I	A. basin vals vals data Harge per sq s and 2"=1 bitions flaring	s by on a	air ; scal	phote e of	ograp 4"—1	hy mil	and e.	500 25 97 139 25 500 14 2 1 103 300. raphy sites 3 and 4 56 52 30 100 20 32	(Ap	sq. miles "" "" "" "" "" "" "" "" "" "" "" "" "

432 Nos, each 50' in depth. Rs. 4,32,000.

•	4. Soil analysis testing .	and bororow	surveys	for	earther	dams	inclu	ding L.S.	Rs. 10,000
	•	ments by India		ays St		1a .	•	L. S.	15,000
	Temporary buildi	ings—10 sites					•	L. S.	1,00,000
									9,74,000
			II. M	ain Ca	nals and E	Branches			
	(a) Survey of the	commanded a	reas for al	ignmer	nts of cana	ls			
	Canals ex-Barg	•		•		•	•		000 acres.
	Canals ex-Taw Canals ex-Bro			•		•	•	11,00, 10,00,	000
	Cultura Cx-D10	acii	• •	•	•	•	•		
								38,00,	,000 acres.
	39,00,000 acres		acre.—						Rs. 43,87,500
	(b) Miscellaneo	-		n Droir	. L. S				20,000
	(c) Exploration and necess	ary survey? L.		· Drau		1			1,00,000
	(d) Soil survey	s 39,00,000 acr	es at Rs. 1	l per	100 acres				39,000
III.	Discharge and S	Sult Observations	(Period 4	uears\					45,46,5 00
	One boatman and	d four Khalasis	at each d	scharg	ge site and				
		pes, discharge and laboratory			uges, silt				
	10 sites (8 on th at Rs. 5,0	e Narbada and 00 per site per		a and l	Burhner)				2,00,000
ıv.	Meteorological Ob Humidity ar	servations, Rai nd wind velocity			ıtın es,				
	Equipment and	installations of	15 new ra	ıngaug	es some				
	of these	to be of the i	integrated	self-re	cording				
		at an average							15,000
	Recurring Exper	- _		rvers					70.000
	15 observers at 1	Rs. 15 p.m. for	4 years	•	• •				10,800
									25,800
	Mineral Surveys		•	•	• •				10,000
	. Survey for Pi scie [. Malarra Survey		•	•	•				2,000 5,000
	II. Electric load S			•					10,000
	. Surveys for Nav	_		•					1,00,000
	Economic and Pro		L. S	•	•				60,000
	. Surveys for soil I I. Communication		•	•					7,500
	Constructing 10					ı-			9.00.000
		for 2 years at	Ks. 3000 p	er mile	• •				3,00,000
XI	II. Special Tools								
	6 Diamond drills each	s complete with	accessorie	es at R	s 60,000				3,60,000
	Testing apparat	us and laborate	ory and we	orksho	p equip-				-,,
	ment for	compressive st for shear st	rength of	rocks a	ınd testi-				
	ture cont	ent and consol	dation etc	L.S.	•				1,00,000
									4,60,000
									67,00,800
	2% Continge	ncies .							1,34,016
	2 /0 COM/MIGO			•	•				
		Total Wo	rks .	•	• •				68,34,816
	II. TOOLS AN								
	1. Motor vehicle	es for survey p t Rs. 7,000 eac		•	• •				98,000
		enses for four y		•	•				1,40,000
	2. Scientific In	•		•					1,20,000
	3. Ordinary To	ols and Plant	•	•	•				10,000
	4. Camp equips	-	•	•	• •'				30,000
	5. Office furnit	ure	•	•	•				4,38,000
	2% Contin	gencies .	•		•			والمنافع والمناوع وا	8,760
	Total	Tools and Plan	ut . T		•				4,46,760

III. ESTABLISHMENT

II. ESTABLISHMENT					Ex	pend	iture per yea	r
1 70 4000						Politic	Rs.	-
1. Pay of Officers							21,000	
Executive Engineers 2 Nos. @ Rs.875- p.m.	•	•	•	•	•	•	•	
Assistant Executive Engineers 4 Nos. @ Rs.60			•	•	•	•	28,800	
	•	•	•	•	•	•	26,880	
Geologist 1 No. @ Rs. 875 p.m	•	•	•	•	•	•	10,500	
Assistant Geologists 2 Nos. @ Rs.500 p.m.	•	. •	•	•	•	•	12,000	
Officer to conduct economic surveys 1 No. @ I			•	•	•	•	6,600	
D. 11 T	p.m	1.	•	•	•	•	•	
Drill Foreman 1 No. @ Rs. 1,000 p.m.	•	•	•	•	٠	•	12,000	
						:	1,17,780	
2 Pay of Establishment								Ra.
3 Meteorological Assistanta @ Rs. 240 p.m.		٠.					•	8,640
2 Accountants @ Rs. 200 p.m		. •					•	4,800
2 Head clerks @ Rs. 180 p. m							•	4,320
6 Senior clerks @ Rs. 150 p.m	_				Ċ			10,800
2 Storekeepers. @ Rs. 150 p.m	•			•	·	·		3,600
14 Junior clerks @ Rs. 93 p.m	•	•	•	·	•	•		15,624
2 Senior Draftsmen @ Rs. 200 p.m.		·	•	•	•	•	•	4,800
4 Junior Draftsmen @ Rs. 143 p.m.	•	•	•	•	•	•	•	3,432
4 Tracers @ Rs. 104 p.m	•	•	•	•	•	•	•	4,992
2 Sub Assistant Surgeons @ Rs. 170 p.m.		•	÷	•	•	•	•	4,080
2 Compounders @ Rs. 50 p.m	•	•	•	•	•	•	•	1,200
32 Overseers @ Rs. 240 p.m	•	•	•	•	•	•	•	
6 Research Assistants @ Rs. 240 p.m.	•	•	•	•	•	•	•	92,160
2 Laboratory Assistants @ Rs. 230 p.m	•	•	•	•	•	•	•	17,280
2 Silt Analysts @ Rs. 200 p.m	•	•	•	•	•	•	•	5,520
2 Assistant silt Analysts @ Rs. 93 p.m	•	•	•	•	•	•	•	4,800
10 Gauge readers @ Rs. 70 p.m.	•	•	•	•	•	•	•	2,232
10 Senior Observers @ Rs. 90 p.m.	•	•	•	•	•	•	•	8,400
0 Defections @ De 00	•	•	•	•	•	•	•	10,800
10 De-1	•	•	•	•	•	•	•	792
14 Theorem (2) The (10)	•	•	•	•	•	•	•	3,960
A Laboratore Wholesia @ Dr. 99	•	•	•	•	•	•	•	5,545
10 Chowkiders @ Rs. 33 p.m.	•	•	•	•	•	•	•	2,376
orowindan & ros. of plant	•	•	•	•	•	•	•	3,960
					Tot	al	•	2,24,112
3. Dearness allowance of Officers	•	•						16,020
4. Dearness allowances for establishment.	•	•						66,480
5. Travelling allowance for Officers .	•	•						40,000
6. Travelling allowances for establishment	•	•						60,000
7. Cost of project Circle office debited to Nark	ada	•						33,000
8. Establishment contingencies	٠	•						20,000
- Establishme	ent p	er yea	r					5,77,392
Grand Total Establishment for 4 years	•	•						23,09,568

G. N. Pandit, Project Officer (Narbada & Tapti). II. Estimate for preliminary surveys und investigations in connection with projects for multipurpose development in the Basin of the Narbada River for the year 1947-48 submitted to Government for sanction.

mitted to Govern	nent for sa	nı vn ıne nction.	Dust	n oj i	ine .	LV AT	oaaa .	arver	Jor	tne y	ear 194	7-48 8UO
I. WORKS	inoiti jor oa	100000101										
Dams and appurt	enants works											
(i) Preliminary												
(ii) Survey to b	_	by the su	irvev of	India	a De	parti	nent				L. S.	Rs. 2,500
1. Survey to be									•	•	L .8	
2. Discharge an				, ,							L. S.	,, 1,990
3. Geological in						•			•	•	L.S.	., 1,000
4. Communicat						•	·				L.S.	
5. Confingencie										-		650
•			•			•				•	/	
II. TOOLS AND	PT.ANT						Tota	l Wor	ks	•	`	Rs. 30,140
		~~~~~~	a am d	åta ar	****	~~~			a T a a			nd matha
(Including t matical instrume	runsport co mts aamm a	nveyunc	e unu eiH eh	218 CL	ti om	uye c	mu re	epair	Cnui	yes <b>s</b>	urvey a	na maine
		lurpuye	5111 UU	servu	vvO7t	$up_I$	yaran	us eic	··)			-
(a) New Suppl		00 - 1										Rs.
9 Weapon carri				•	•		•	•			•	63,000
3 Jeeps with tr			• •	•	•		•	•		•	•	21,000
2 Chronographs			• •	•	•	•	•	• •	•	•	•	200
2 current meters	-		•	•	•		• •	•	•	•		2,000
2 large boats @			• •	•	•	•	• •	•	•	•		2,000
2 small boats @ Discharge rods				•	•	•	•	•	•	•		1,000
Sounding rods	•	•	•	•	•	•	•	•	•	•		200 100
Ropes	•	•	•	•	•	•	•	•	•	•	4	500
One set of appar	estus for silt o	hservation	a @ Ra	1 500	Inge	h and	ramai	nina le	horet	omz ec	min.	000
ment .	audio tot atti o	DOOL A COLOT		,1,000	- enci	u auu	TOTTION	rrtrr 2 10	enora.	ory or	լաբ	2,200
(b) Repairs and	Carriage	• •	•	•	•	•	•	•	•	•	•	_,200
Repairs to truck	_											1,500
aropazza do drada		•		•	•	•	•	•	•	•	•	
	Grand Total	of Tools a	and Plan	nt	•	•	. •	•	•	•	•	93,700
III. ESTABLISHM	ENT-											
(a) Pay of Office	ers											
2 Executive Eng		nonths @	Rs. 900	) p.m.								5,400
4 Assistant Eng	ineers for 3 m	onths @	Rs. 35	0 p.m.				•	•	•	•	4,200
1 Geologist for	s montus @ 1	(6. 900 p.1	n	•	•	*	•	•	•	•	•	1,800
							Tota	d.				11,400
Pay of establish	ment											····
11 Overseers for		Rs. 180 1	n m.									5,940
2 Accountants f				•	•	•	•	•	•	•	•	1,200
2 Head clerks fo				•	•	•		•	•	•		960
1 Sub Assistant	_	-	_	200 n	.m.	•	•	•	•	•	•	400
3 clerks for 3 m			(a) 2001	200 p		•	•	•	•	•		720
4 Sub Divisions			Re. 7	້ ກັກ.m.		•	•	·		-	•	900
l Head Draftsm		-			•	•	·					750
2 Junior Drafts		-	-									600
4 Tracers for 3		-	_							-	•	960
1 Dispenser for	_	_									•	160
1 Daffadar for 2	-					•	•			•		7
3 Barkandaz for	_	-								•	•	27
7 Peons for 3 m	_		•				•				•	630
4 Peons for 3 n	_					•						3€0
5 Chowkidars fo	-	•						•	•		• .	450
4 Dak runners f		_		•				•	•		•	360
11 Khalasis for					m.					•	•	990
7 Gauge readers										•	•	630
Geologist—staff								•			•	1,000
4,000,000												17.950
												17,850
Dearness allows	ance and Spee	ial new of	Officer	T. S.	_					_		1,150
Dearness allows	ance of establ	ishment	· ·	L.S.	•	•	:				•	7,000
Travelling allow												
1. Executive E			•									1,400
2. Assistant En			•	•	•	•	•	•	•	•	•	1,800 1,00 <b>0</b>
3. Geologists		• •	•	•	•	•	•	•	•	•	-	
												4,200

Travelling Allowance of	Est	ablis	hmen	t										
Supervisors .			•		•									2,000
Other staff (Execut	ive I	Ingir	eers)				•						•	2,006
Geologist-Other S	taff	-	•	•	•	•			•	•				400
													-corregio in	4,400
(b) Establishment Cont	tinge	ncies												
Rent for Divisional	-			ional	Office	es							•	1,000
Rent for Geologists'	Offic	ces	•	•	٠	•	•	•	•	•	•			400
G	rand	l tota	al of e	stabl	shme	nt				•		•	•	46,900
I. Works .							30,	140						
II. Tools and Plant							93	,700						
III. Establishment	•	•	•	•			46	,900						
Total .							1,70	740	-					

G. N. PANDIT,
Project Officer, (Narhada and Tapti.)

III. Estimate for the Preliminary surveys and investigation in connection with the project for multipurpose developments in the Basin of the Narbada River for the year 1948-49, submitted to Government for sanction.

T Wash	joi	0000	oi eO7i	•						
I. Works										
1. Dams and appurtenant works.—A Prelimin	*	-	rsea.							Rs.
Survey to be carried out by the survey of	Indi	8.		•	•				L.S.	3,00,000
Survey to be carried out by or under the	direc	ction o	of C.W	7.I.N.	J.		•		L.S.	20,000
K. Buildings		•			•	•	•		L.S.	50,000
2. Main canal and branches.—										
Miscellaneous surveys such as canal alignm	ents	s, spec	al res	ervoi	surv	eys e	te.		L.S.	40,000
Soil surveys						,			L.S.	70,000
3. Meteorological surveys.—										•
Rain gauges—It is proposed to install	70 n	AW PO	in on	TOPE !	(4) E.a	nin.				
ment and installation of gaugues—70	) 1	new r	ain ga	uges	inclu	ding				
temperature, humidity and wind	velo	city ap	parat	us at	35 pl	aces			000	
and some self-recording guages at an	ave	rage r	ate of	Ks. 50	JU eac	h		35,	000	
(ii) Observation Expenditure per year										
3 Meteorological Assistants @ Rs. 200 p.	m.	•	•	•	•			7,	200	
3 Senior Observers @ Rs. 120 p. m	4.	٠.	•	•	•			4,	320	
70 part time Observers @ Rs. 15 p.m.		•	•	•	•	•		12,	600	
70 Part time Retainers @ Rs.12 p.m.	•	•	•	•	•	•		10,	080	
						-		34	220	69,000
								U±,	220	
5 Geological investigations and mineral si	17770	272							L.S.	( <b>say</b> )
6 Communications L.S	ur ve,	ys	•	•	•	•	•	•	11.13.	20,000
7 Special Tools and Plant (Drill equipmen	· nt ar	വർണ	• naratı	e for	Boil le	horst	oru l	•	L.S.	50,000 12,00,000
. 70			•				(O1.y.)	•	L.S.	6,000
9 Hydro Electric Installations—A prelim					a T.oo	3 aur	*	•	L.S.	
10 Contingencies @ 2%	marj	, expe	11303 1	2100011	U LJUA	u sui	voys		11.0.	5,000
To containg oncion (a) 2/6	•	•	•	•	•	•	•	•	•	61,000
Total Wo	rks	•	•	•	•	•	•	٠	•	19,41,000
II. Tools and Plant—										
7 country boats @ Rs. 1000 each .				•		•				7,000
3 outboard motors @ Rs.1000 each										3,000
16 chronographs at Rs. 100 each .				•						1,600
18 levelling instruments at Rs. 800 each										14,400
3 theodolites at Rs. 1500 each .			•							4,500
3 Binoculars at Rs. 200 each										600
l camera at Rs. 600										600
18 measuring chains @ Rs. 15 each								.•	•	270
60-100 ft. tapes at Rs. 30 each .										1800
60-50 ft. tapes at Rs. 20 each .		•								1,200
7 steel tapes @ Rs. 100										700
7 drawing boards at Rs.30 each .										210
7 2nd class drawing instrument boxes @	Rs.	200 e	ach							1,400
2 first class drawing instrument boxes @										600
Scales with offsets, etc. french curves an					ific in	strun	nents	and t	aloos	
and plant		•	•		•	•	•	•		1,00
10 current meters @ Rs. 1000 each .	•		•	•	•	•		•	•	10,000
10 large boats at Rs. 1000 each .	•		•	•	•	•	•	•	•	10,000
10 small boats at Rs. 500 each	•	•	•	•	•	•	•	•	•	5,000 '
Discharge rods		•	•		•	•	•	•	•	2,300
Sounding rods		•		•		•			•	1,100
Ropes			•	•		•			•	2,500
I set of apparatus for silt observations		•	•		•	•	•	•	•	1,500
Recurring laboratory expenses .		•	•	•	•	•	•	•		300
15 Nos. 14' × 14' tents @ Rs. 1200 each			•		٠.	•	•	•	•	18,000
40 Nos. 10'× 10' tents @ Rs. 800 each.			•	•	•	•	•	•	•	32,000
40 Nos. shouldaries at Rs.600 each.			•	•	•	•	•		•	24,000
40 servants' tents at Rs. 500 each					. •	•	•	•	•	20,000
Camp furniture					•	•				58,000
Office furniture for Divisional and Sub l	Divis	sional	offices	з.	•					15,000
Office furniture for soil physicist office s								•		2,500
Office furniture for geologist office .								•	•	_ 2,500
Repairs and Carriage — yearly repairs	to tr	ucks		•	•	•	•	•		<b>5,42</b> 0
Contingencies at 2%		•					•	•	•	4,000
Total T	ماموا	and T	Dlant						-	2,00,00 0
TOTAL T	OODS	and I	14111	•	•	•	•	•	• _	_,00,000

30								-
III.—Establishment.—								
(a) Pay of officers.—								
2 Executive Engineers at Rs. 900 p.m. for 12 months								21,600
8 Assistant Engineers at Rs. 350 p.m. for 12 months								33,600
1 Geologist at Rs.600 p.m. for 12 months								7,200
2 Assistant Geologists at Rs. 400 p.m. for 12 months								9,600
1 Soil Physicist at Rs. 275 p.m. for 12 months .		•						3,300
								75,300
(b) Pay of establishment.—								
32 overseers at Rs. 180 p.m. for 12 months	•	•	•	•	•	•	•	69,120
2 Accountants at Rs. 200 pm. for 12 months	•	•	•	•	•	•	•	4,800
2 head clerks at Rs. 160 p.m. for 12 months	•	•	•	•	•	•	•	3,840
2 sub asstt, surgeons at Rs. 200 p.m. for 12 months	•	•	•	•	•	•	•	4,800
10 clerks at Rs. 80 p.m	•	•	•	•	•	•	•	9,600
2 Head draftsmen for 12 months at Rs. 250 p.m	•	•	•	•	•	•	•	14,400 6,000
2 Junior draftsmen for 12 months at Rs. 200 p.m.	•	•	•	•	•	•	•	2,400
4 tracers for 12 months at Rs. 80 p.m.	•	•	•	•	•	•	•	3,840
O demonstrate for 19 months at To . OA	•	•	Ċ	•	•	•	•	1,920
a deffedent for 19 months at Dr. 25	•	•	•	•	•	•	•	840
10 houles des for 19 months of Dr. 20	•	•	•	•	•	•	•	3,600
22 peons for 12 months at Rs. 30 p.m	•	•	•	•	•	•	•	7,920
12 poons for 12 months at Rs. 30 p.m.	•	•	•	•	•	•	•	4,320
10 chowkidars for 12 months at Rs. 30 pm.	•	•	•	•	•	•	•	3,600
12 Dak runners for 12 months at Rs. 30 p.m.	•	•	•	•	•	•	•	4,320
32 khalasis for overseers for 12 months at Rs. 30 p.m.		•		•	•	•	•	11,520
20 gauge readers for 12 months at Rs. 30p.m.		•	•	•	•	•	•	7.200
Geologist staff L.S.			•		•	•	•	4,000
6 sub overseers at Rs.50 pm. for 12 months	•	•	•	-	٠.	•	•	3,600
3 Laboratory assistants at Rs. 100 p.m. for 12 months					•	•	·	3,600
2 clerks at Rs. 40 p.m. for 12 months			•	·	·		·	960
1 computor at Rs. 40 p.m. for 12 months							•	480
1 tracer at Rs. 40 p.m. for 12 months	•							480
3 laboratory peons at Rs. 25 p.m. for 12 months .	,							900
2 peons at Rs. 25 p.m. for 12 months	•							600
1 Tapali at Rs. 25 p.m. for 12 months.	•					•		300
4 Auger measurers at Rs. 40 p.m. for 12 months.	•		•					1920
								1,80,880
Dearness allowance and special pay of officers							_	26,420
Dearness allowance of establishment L.S.				•	•		•	73,000
Travelling allowance of officers:-		•	Re		-	•	•	10,000
Executive Engineers.			5,80	00				
Asstt. Engineers Geologists	•		14,40					
Asstt. Geologists	•		8,00 9,00					
Soil Physicist	•		5,00					
Travelling allowance of establishment	*****							42,200
Supervisors			28,00	ю				
Other staff XEN's			10,00					
Other staff (Geologist)			1,60					
Soil survey staff.—	*		_, _,	,,				
Sub overseers			2,00	00				
Auger measurers			2,00	-				
Other staff	•		2,00					
(c) Establishment contingencies.—		-	<del>-</del>					
Rent for Divnal and Sub. Divl. offices								
Rent for soil physicist's office and lab.			4,00					45,600
Rent for Geologist's office			1,00					
			1,60	10			_	6,600
Total Establishment	•	•					_	4,50,000
Abstract.— 'I. Works							-	the state of the s
II. Tools and Plant	•	1	9,41,00					
III Establishment	•		2,00,0					
	•	<del>.,</del> ,	4,50,0	UU .				
Grand Total	•	2	5,91,00	00				

G. N. PANDIT Project Officer, Narbada and Tapti. IV.—Estimate for preliminary surveys and investigations in connection with Projects for the multi-purpose developments of the Narbada Basin Prepared in accordance with the instructions of the ad hoc Committee.

. Bargı Project				Ab	stract										
·	•	•	•	•		•	•	•	•	•		•	•	•	27,39,1
. Tawa Project	•	•	•	•	•	•	•	•	•	•		•	•	•	15,42,6
. Punasa Project	•	•	•	•	•	•	•	•	•	•		•	•	•	7,35,3
Broach Project	•	•	•	•	•	•	•	•	•	•		•	•	•	11,02,2
General Surveys	•	•	•	•	•	•	•	•	•	•		•	•	•	3,77,
						tal y Rs.		•	•				•		64,97,08 64,97,00
Estimate for th Bilgarha and Ba on Barg .	re pre ergi a	elim ind o	nar on th	y sur ie Bi	ırhne	r Ri	ver c	stiga it Gl	itions hugri	for and	dam a co	site anal	s on syst	the em to	Narbad iking d
works.—		_			At	straci									
<ol> <li>Dams and appurt A. Preliminary exp</li> </ol>	enant penses	worl	·			•		,							2,35,80
K. Buildings															30,00
. Main Canals and I	Branck	nes				•									10,98,50
. Malarıa Surveys															1,00
. Electric Load Sur	veys .						•								2,00
Property Surveys		,						•							7,50
Communications .							•								1,00,00
Special Tools and	Plant			•	•	•	•	•	•	•	•	•	•		1,60,0
2% conting	encies								•						16,34,8 32,6
													•		16,67,4
. TOOLS AND PI		ı	•	•	•	•		•	•	٠	•	,		•	2,05,5
I. ESTADLISHM		otal		•	•	•	•	•	•	•	•	•	• .		8,66,0 27,39,1
A. Preliminary Ex	cpenses	3,		1	-1				J						
• •	rvoir l 10 ft.	s.— basın	s by	air ph ervals	on a	aphy scale sq. m •8 sq.	of 4". ules	—1 m	d surv	ey ar	d pl	otting	g of		
1. Survey of Resecontours at Ghugri dam	rvoir l 10 ft.	s.— basın	s by	air ph ervals •	on a . 50 . 25	scale sq. n	of 4″. ules mule	—1 m	d surv nle.	ey ar	d pla	otting	g of		
A. Prehmmary Ex 1. Survey of Reserventours at Ghugri dam Bilghara	rvoir l 10 ft.	s.— basın	s by	air ph ervals •	on a . 50 . 25 . 97	scale sq. n ·8 sq.	of 4″- niles miles miles	—1 m	d surv	ey ar	d plo	otting	g of		
A. Prehmmary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi .  172.8 sq. m. at Rs	ryonser 10 ft.	basın —5 f	s by t. int	ervals	on a . 50 . 25 . 97	scale sq. m ·8 sq. r sq. r	of 4". niles miles miles q. mi	—1 m s	ale.						
A. Prehmmary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi .  172.8 sq. m. at Rs.  2. Survey of dam at 32" — 1 mile,	rpenses rvoir 1 10 ft.	basın —5 f	s by t. int sq. n photes at	ervals  nile ograph Rs. 4	on a . 50 . 25 . 97 17	scale sq. n ·8 sq. r ·8 sq. r ·2 8 sq. r	of 4". ules ules ules ules ules ules ules ules	—1 m s	ale.						65,0
A. Prehmmary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi .  172.8 sq. m. at Rs. 2. Survey of dam s 32" — 1 mile. 3. Geological myes	rpenses rvoir 1 10 ft.	basın —5 f	s by t. int sq. n photes at	ervals  nile ograph Rs. 4	on a . 50 . 25 . 97 17	scale sq. n ·8 sq. r ·8 sq. r ·2 8 sq. r	of 4". niles miles miles q. mi	-1 m s les rvey	ule. and pl						65,0
A. Prehmmary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs. 2. Survey of dam a 32"—1 mile. 3. Geological inversion of bores.—	rpenses rvoir 1 10 ft.	basın —5 f	s by t. int sq. n photes at	ervals  nile ograph Rs. 4	on a . 50 . 25 . 97 177	scale sq. m ·8 sq. r ·8 sq. r ·2 8 sq. r · d grou	of 4". niles miles miles q. mi	-1 m s les rvey	ule. and pl						65,0
A. Prehmmary Ex  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs 2. Survey of dam s 32"—1 mile, 3. Geological invertible No. of bores.— Bilghara	rpenses rvoir 1 10 ft.	basın —5 f	s by t. int sq. n photes at	ervals  nile ograph Rs. 4	on a . 50 . 25 . 97 17	scale sq. n ·8 sq. r ·8 sq. r ·2 8 sq. r ·1 grou acre	of 4". niles miles miles q. mi	-1 m s les rvey	ule. and pl						65,0
A. Prehmmary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs. 2. Survey of dam s. 32"—1 mile, 3. Geological investigation of bores.—Bilghara Ghugri.	rpenses rvoir 1 10 ft.	basın —5 f	s by t. int sq. n photes at	ervals  nile ograph Rs. 4	on a . 50 . 25 . 97 17 17	scale sq. m ·8 sq. r ·8 sq. r ·2 8 sq. r ·1 grou acre  Nos. Nos.	of 4". niles miles miles q. mi	-1 m s les rvey	ule. and pl						65,0
A. Preliminary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs. 2. Survey of dam s. 32"—1 mile. 3. Geological investigation of bores.—Bilghara	rpenses rvoir 1 10 ft.	basın —5 f	s by t. int sq. n photes at	ervals  nile ograph Rs. 4	on a . 50 . 25 . 97 17 17	scale sq. n ·8 sq. r ·8 sq. r ·2 8 sq. r ·1 grou acre	of 4". niles miles miles q. mi	-1 m s les rvey	ule. and pl						65,0
A. Preliminary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs. 2. Survey of dam s. 32"—1 mile, 3. Geological investigation of bores.—Bilghara Ghugri.	rpenses rvoir 1 10 ft.	basın —5 f	s by t. int sq. n photes at	ervals  nile ograph Rs. 4	on a . 50 . 25 . 97 . 17	scale sq. m ·8 sq. r ·8 sq. r ·2 8 sq. r ·1 grou acre  Nos. Nos.	of 4". niles miles q. mi	-1 m s les rvey	ule. and pl						65,0
A. Preliminary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs. 2. Survey of dam a 32" — 1 mile. 3. Geological inversions of bores.—Bilghara Ghugri. Bargi.	ryonr 1 10 ft. . 375 sates b 2,70 stigati	s.— basın —5 f	s by t. int sq. n photoes at .	ervals	on a . 50 . 97 17 17	scale sq. m ·8 sq. r ·8 sq. r ·2 8 sc l grou acre Nos. Nos.	of 4". niles miles q. mi	-1 m s les rvey	ule. and pl						65,0 10,8
A. Preliminary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs. 2. Survey of dam a 32"—1 mile. 3. Geological invertion of bores.—Bilghara Ghugri. Bargi.  148 bores each 50	ryonser rvoir 10 ft. 	per y air ons f	s by tt. int.  sq. n photes at for for	ervals	on a . 50 . 97 17 17	scale sq. m ·8 sq. r ·8 sq. r ·2 8 sc l grou acre Nos. Nos.	of 4". niles miles q. mi	-1 m s les rvey	ule. and pl				e of	L.S.	65,0 10,8
A. Preliminary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs.  2. Survey of dam a 32"—1 mile.  3. Geological investing No. of bores.—Bilghara Ghugri. Bargi.  148 bores each 50 at Soil analysis at	ryenses rvoir 1 10 ft	per y air ons f	s by tt. int.  sq. n photes at for for	ervals	on a . 50 . 97 17 17	scale sq. m ·8 sq. r ·8 sq. r ·2 8 sc l grou acre Nos. Nos.	of 4". niles miles q. mi	-1 m s les rvey	ule. and pl				e of .	L.S. L.S.	65,0 10,8 - 1,48,0 - 7,0
A. Preliminary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs.  2. Survey of dam s 32"—1 mile.  3. Geological invertions of bores.—Bilghara Ghugri. Bargi.  148 bores each 50	ryenses rvoir 1 10 ft	per y air ons f	s by tt. int.  sq. n photes at for for	ervals	on a . 50 . 97 17 17	scale sq. m ·8 sq. r ·8 sq. r ·2 8 sc l grou acre Nos. Nos.	of 4". niles miles q. mi	-1 m s les rvey	ule. and pl				e of .		1,48,0 7,0
A. Preliminary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs.  2. Survey of dam a 32"—1 mile.  3. Geological inversion No. of bores.—Bilghara Ghugri. Bargi.  148 bores each 50  4. Soil analysis at 5. Model experiments.	ryenses rvoir 1 10 ft.	per yair was a Rs.	s by tt. int.  sq. n photes at for for	ervals	on a . 50 . 97 17 17	scale sq. m ·8 sq. r ·8 sq. r ·2 8 sc l grou acre Nos. Nos.	of 4". niles miles q. mi	-1 m s les rvey	ule. and pl				e of	L.S.	1,48,0 7,0 5,0
A. Preliminary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs.  2. Survey of dam a 32"—1 mile.  3. Geological inversion of bores.—Bilghara Ghugri. Bargi.  148 bores each 50 4. Soil analysis at 5. Model experiments.  Buildings.— Temporary Building Main canals and by	ryenses rvoir 1 10 ft.  3. 375 sites by 2,70 stigati  .  rft. at nd bui ents  ranche.	per yair 00 acroons f	s by the interest of the second of the secon	ervals	on a . 50 . 25 . 97 17	scale sq. n ·8 sq. r ·8 sq. r 2 8 ss. · sq. r · l grou acre Nos. Nos. · .	of 4". nules . mile miles q. mi	-l m	and pl	ottm			e of .	L.S.	1,48,0 7,0 5,0
A. Preliminary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs.  2. Survey of dam a 32"—1 mile.  3. Geological inversion No. of bores.—Bilghara Ghugri. Bargi.  148 bores each 50  4. Soil analysis at 5. Model experiments.  Buildings.— Temporary Buildings.	ryenses rvoir 1 10 ft.  3. 375 sites by 2,70 stigati  .  rft. at nd bui ents  ranche.	per yair 00 acroons f	s by the interest of the second of the secon	ervals	on a . 50 . 25 . 97 17	scale sq. n ·8 sq. r ·8 sq. r 2 8 ss. · sq. r · l grou acre Nos. Nos. · .	of 4". nules . mile miles q. mi	-l m	and pl	ottm			e of	L.S.	1,48,0 7,0 2,35,8
A. Prehmmary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs.  2. Survey of dam a 32"—1 mile.  3. Geological inversion No. of bores.—Bilghara Ghugri. Bargi.  148 bores each 50 4. Soil analysis at 5. Model experiments.—Temporary Buildings.—Temporary Buildings.—Temporary Buildings.—Temporary Buildings.—Survey of com	ryenses rvoir 10 ft	per y air voons f	s by the interest of the second of the secon	ervals	on a . 50 . 25 . 97 17	scale sq. n ·8 sq. r ·8 sq. r 2 8 ss. · sq. r · l grou acre Nos. Nos. · .	of 4". nules . mile miles q. mi	-l m	and pl	ottm			e of	L.S.	1,48,0 10,8 1,48,0 7,0 5,0 2,35,8 30,00 10,12,5 8,00
A. Preliminary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs.  2. Survey of dam a 32" — 1 mile.  3. Geological inversion of bores.— Bilghara Ghugri. Bargi.  148 bores each 50 d. Soil analysis at 5. Model experiments.  Buildings.— Temporary Building Main canals and by (a) Survey of com (b) Miscellaneous (b) Miscellaneous (controlled to the survey of com (controlled to the survey of com (d) Miscellaneous (d) Miscellaneo	ryonser rvoir 10 ft	per yair was a same a s	s by t. int  sq. in photoes at correct to surve.  20 I surve.	ervals	on a . 50 . 25 . 97 17	scale sq. n ·8 sq. r ·8 sq. r 2 8 sa ·1 grou acre Nos. Nos. · Nos. · Nos.	of 4". nules	-l m	and pl	ottm			e of .	L.S.	1,48,0 7,0 2,35,8 30,00
A. Preliminary Ex.  1. Survey of Resecontours at Ghugri dam Bilghara Bargi.  172.8 sq. m. at Rs.  2. Survey of dam a 32" — 1 mile.  3. Geological inversion of bores.— Bilghara Ghugri. Bargi.  148 bores each 50 d. Soil analysis at 5. Model experiments.  Buildings.— Temporary Building Main canals and by (a) Survey of com	ryonr 10 ft.  3. 375 sites by 2,70 stigati  rft. at nd burents  ranche mande survey r foun	per y air vo acrows fine seed ar vo acrows of seed	s by t. int sq. in photoes at cor for surve ea 18	ervals  nile ograph Rs.  undat  oer rft ys 00,00	on a . 50 . 25 . 97 17	scale sq. n ·8 sq. r ·8 sq. r 2 8 sa ·1 grou acre Nos. Nos. ·1 Nos. ·2 Nos ·1 works	of 4". nules	-l m	and pl	ottm			e of .	L.S.	1,48,0 7,0 2,35,8 30,0 10,12,5

												Rs
III. Malaria surveys .	•	•	•	•	•	•	•	•	•	•	•	1,000
IV. Electric load surveys	•	•	•	•	٠.	•	•	•	•	•	•	2,000
V. Property surveys 173 sq.	mile	s at R	s. 43	per sq	. mıle	•	•	•	•	•	٠.	7,500
VI. Communications .	•	•	•	•	•	•	•	•	•	•	•	1,00,000
VII. Special Tools and Plant					•	•		•	•	•	•	• •
2 Diamond drills					•	•		•		•		1,20,000
Testing apparatus .					•				•			40,000
											-	7 60 000
												1,60,000
I, TOOLS AND PLANT.												
Motor vehicles 7 vehicles at	Rs. 7	.000	`									49,000
Working expenses for 3 years		,,,,,	•	-								52,500
Scientific Instruments .	.,	•	•	•	•	•	•	•	•	•		60,000
	•	•	•	•	•	•	•	•	•	•	•	5,000
Ordinary Tools and Plant	•	•	•	•	•	•	•	•	•	•	•	15,00
Camp equipage	•	•	•	•	•	•	•	•	•	•	•	-
Office furniture	•	•	•	•	•	•	•	•	•	•	•	20,000
												2,01,50
												• •
2 % contingencies .	•	•	•	•	•	•	•	•	•	•	•	4,03
												2,05,53
ESTABLISHMENT:												
Cost of 1 Division for 3 year	a at	Rs. 2.	88.696	ner v	rear						_	8,66,08
555 51 1 mm o g		· - <b>,</b>	,	1 0		-	-			-	-	-,,
2. Estimate for the prel	limi	nary	surv	eys a	nd i	nvest	iguti	ons f	or a	dam	si e	on the Tar
ver, and a left bank cana												
, o., a v.g	•		-JJ J .		Abstr	-	r. P.		-0 -0			••
. WORKS.—					22.0007	400						
. Dams and appurtenant wor	Ks											
A. Preliminary expenses—	•	•	•	•	•	•	•	•	•	•	•	87,12
K. Buildings		•		•		•	•	•			•	25,00
. Main canals and branches												6,59,75
												1,00
. Maiaria surveys .			•	•								
<del>-</del>	•	•	•	•	•	•	•	•	•	•	•	•
. Electric load surveys .	•	•	:	•	•	•	•				•	50
Electric load surveys	•	•	•	•	•	•	•	•	•	•	•	50 6,00
Electric load surveys	•	•	•	•	•	:	•	•	•	•	•	50 6,00 80,00
Electric load surveys	•	•	•	•	•		•	•	•	•	· ·	50 6,00 80,00
Electric load surveys	•	•	•	•	•	•	•	•	•	•	· ·	50: 6,00 80,00 1,35,00
Electric load surveys  Property surveys  Communications  Special Tools and Plant	•		•		•		•	•	•	•	•	500 6,00 80,00 1,35,00 9,94,37
Electric load surveys	•		•	•	•	•	•	•	•	•	•	500 6,00 80,00 1,35,00 9,94,37
1. Electric load surveys 2. Property surveys 3. Communications 7. Special Tools and Plant		•	•				•	•	•			500 80,00 80,00 1,35,00 9,94,37 19,88
2 % contingencies .  Total Works	•						•	•		•		500 80,00 1,35,00 9,94,37 19,88
2 % contingencies .  Total Works  TOOLS AND PLANT .	•				•		•		•	•		500 80,00 1,35,00 9,94,37 19,88
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  II. TOOLS AND PLANT.	•									•		50 6,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  II. TOOLS AND PLANT.		· · · · · · · · · · · · · · · · · · ·										50 8,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,0g
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  II. TOOLS AND PLANT.		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·									50 8,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,0g
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  II. TOOLS AND PLANT.  III ESTABLISHMENT.		· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		:							500 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,04
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  II. TOOLS AND PLANT  III ESTABLISHMENT  III WORKS—		· · · · · · ·	· · · · · · · · · · · · · · · · · · ·		tails							500 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,04
Electric load surveys Property surveys Communications Special Tools and Plant  2 % contingencies Total Works II. TOOLS AND PLANT III ESTABLISHMENT  II. WORKS—  1. Dams and appurtenant work		· · · · · ·	· · · · · · · · · · · · · · · · · · ·		tails							50 8,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,0g
Electric load surveys Property surveys Communications Special Tools and Plant  2 % contingencies Total Works II. TOOLS AND PLANT III ESTABLISHMENT III WORKS— 1. Dams and appurtenant work A. Preliminary Expenses—												50 8,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,0g
Electric load surveys Property surveys Communications Special Tools and Plant  2 % contingencies Total Works TOOLS AND PLANT ESTABLISHMENT  WORKS— Dams and appurtenant work Preliminary Expenses—  1. Survey of reservoir basin	bv a	ir pho	togra	nhw an	nd orm		·	and p	lottin	g cont	tours	50 8,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,0g
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  TOOLS AND PLANT  ESTABLISHMENT  WORKS—  Dams and appurtenant work  Preliminary Expenses—  Survey of reservoir basin at 10 ft.—5 ft. interva	bv a	ir pho	togra	nhw an	nd orm	139 g		and p	lotting Rs. 3	g con:	tours er sq.	50 8,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,04 15,42,67
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  TOOLS AND PLANT  ESTABLISHMENT  WORKS—  Dams and appurtenant work  A. Preliminary Expenses—  Survey of reservoir basin at 10 ft.—5 ft. intervamile	by a ls on	ir pho a sca	tograp	ohy an	id gro	139 s	ıq. mi	les at	Rs. 3	75 p	er aq.	50 8,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,04 15,42,67
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  I. TOOLS AND PLANT  III ESTABLISHMENT  I. WORKS—  1. Dams and appurtenant work  A. Preliminary Expenses—  1. Survey of reservoir basin at 10 ft.—5 ft. intervamile  2. Survey of dam site by as	by a ls on ·	ir pho a sca otogra	tograp le of 4	ohy an '' — 1 and gro	id gro	139 s	ıq. mi	les at	Rs. 3	75 p	er aq.	500 80,000 1,35,000 9,94,37 19,88 10,14,26 95,37 4,33,04 15,42,67
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  I. TOOLS AND PLANT  III ESTABLISHMENT  I. WORKS—  1. Dams and appurtenant work  A. Preliminary Expenses—  1. Survey of reservoir basin at 10 ft.—5 ft. intervamile  2. Survey of dam site by a 32"—1 mile 500 acres	by a ls on ir ph	ir pho a sca otogra Rs. 4 p	tographe of 4	ohy and grove	nd gro	139 s survej	sq. mi · 7 and ·	les at · plotti	Rs. 3 ng on	75 po a.sca	er sq. le of	500 80,000 1,35,000 9,94,37 19,88 10,14,26 95,37 4,33,04 15,42,67
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  I. TOOLS AND PLANT  III ESTABLISHMENT  I. WORKS—  1. Dams and appurtenant work  A. Preliminary Expenses—  1. Survey of reservoir basin at 10 ft.—5 ft. intervamile  Survey of dam site by as 32"—1 mile 500 acres  3. Geological investigations drilling, making drifts,	by a ls on ir ph s at I s for	ir pho a sca otogra Rs. 4 p	tographe of 4	ohy and grove	nd gron	139 s survey	q, mi , and ,	les at plotti	Rs. 3	75 p	er sq.	500 80,000 1,35,000 9,94,37 19,88 10,14,26 95,37 4,33,04 15,42,67
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  I. TOOLS AND PLANT  III ESTABLISHMENT  I. WORKS—  1. Dams and appurtenant work  A. Preliminary Expenses—  1. Survey of reservoir basin at 10 ft.—5 ft. intervamile  Survey of dam site by ai 32"—1 mile 500 acres  3. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft.	by a ls on ir ph s at I s for tun	ir pho a sca otogra Rs. 4 p found nelling	tographe of 4	ohy and grove	nd gron	139 s survey	q, mi , and ,	les at plotti	Rs. 3	75 p	er sq.	50 6,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,0 15,42,67
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  I. TOOLS AND PLANT  III ESTABLISHMENT  I. WORKS—  1. Dams and appurtenant work  A. Preliminary Expenses—  1. Survey of reservoir basin at 10 ft.—5 ft. intervamile  2. Survey of dam site by as 32"—1 mile 500 screes  3. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft.  4. Soil surveys and burrow	by a ls on ir phos at I for tuni	ir pho a sca otogra Rs. 4 p found nelling	tograp le of 4 uphy a per aci ations g etc.	ohy and grees of dainclud	d grod mile ound s m and ling te	139 s survey d rese	q, mi , and ,	les at plotti	Rs. 3	75 po a sca oring, each	er sq. le of core of 50	50 6,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,04 15,42,67
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  I. TOOLS AND PLANT  III ESTABLISHMENT  I. WORKS—  1. Dams and appurtenant work  A. Preliminary Expenses—  1. Survey of reservoir basin at 10 ft.—5 ft. intervamile  2. Survey of dam site by as 32"—1 mile 500 screes  3. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft.  4. Soil surveys and burrow	by a ls on ir phos at I for tuni	ir pho a sca otogra Rs. 4 p found nelling	tograp le of 4 uphy a per aci ations g etc.	ohy and grees of dainclud	d grod mile ound s m and ling te	139 s survey d rese	q, mi , and ,	les at plotti	Rs. 3	75 po a sca oring, each	er sq.	50° 6,00° 80,00° 1,35,00° 9,94,37° 19,88° 10,14,26° 95,37° 4,33,04 15,42,67°  52,15° 2,00° 30,00° 1,00°
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  I. TOOLS AND PLANT  III ESTABLISHMENT  I. WORKS—  1. Dams and appurtenant work  A. Preliminary Expenses—  1. Survey of reservoir basin at 10 ft.—5 ft. intervamile  Survey of dam site by ai 32"—1 mile 500 acres  3. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft.	by a ls on ir phos at I for tuni	ir pho a sca otogra Rs. 4 p found nelling	tograp le of 4 uphy a per aci ations g etc.	ohy and grees of dainclud	d grod mile ound s m and ling te	139 s survey d rese	q, mi , and ,	les at plotti	Rs. 3	75 po a sca oring, each	er sq. le of core of 50	50° 6,00° 80,00° 1,35,00° 9,94,37° 19,88° 10,14,26° 95,37° 4,33,04 15,42,67°  52,15° 2,00° 30,00° 1,00°
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  I. TOOLS AND PLANT  III ESTABLISHMENT  I. WORKS—  1. Dams and appurtenant work  A. Preliminary Expenses—  1. Survey of reservoir basin at 10 ft.—5 ft. interva mile  2. Survey of dam site by as 32"—1 mile 500 acres  3. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft.  4. Soil surveys and burrow  5. Model experiments by In	by a ls on ir phos at I for tuni	ir pho a sca otogra Rs. 4 p found nelling	tograp le of 4 uphy a per aci ations g etc.	ohy and grees of dainclud	d grod mile ound s m and ling te	139 s survey d rese	q, mi , and ,	les at plotti	Rs. 3	75 po a sca oring, each	er sq. le of core of 50	500 6,00 80,000 1,35,000 9,94,37 19,88 10,14,26 95,370 4,33,04 15,42,67 52,13 2,00 30,00 1,00 2,00
i. Electric load surveys i. Property surveys i. Communications 7. Special Tools and Plant  2 % contingencies Total Works II. TOOLS AND PLANT III ESTABLISHMENT  I. WORKS—  1. Dams and appurtenant work A. Preliminary Expenses— 1. Survey of reservoir basin at 10 ft.—5 ft. intervamile 2. Survey of dam site by a 32"—1 mile 500 acres 3. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft. 4. Soil surveys and burrow 5. Model experiments by In  K. Buildings.—	by a ls on ir phos at I for tuni	ir pho a sca otogra Rs. 4 p found nelling	tograp le of 4 uphy a per aci ations g etc.	ohy and grees of dainclud	d grod mile ound s m and ling te	139 s survey d rese	q, mi , and ,	les at plotti	Rs. 3	75 po a sca oring, each	er sq. le of core of 50	500 80,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,04 15,42,67 52,15 2,00 30,00 1,00 2,00
i. Electric load surveys i. Property surveys i. Communications 7. Special Tools and Plant  2 % contingencies Total Works II. TOOLS AND PLANT III ESTABLISHMENT  I. WORKS— 1. Dams and appurtenant work A. Preliminary Expenses— 1. Survey of reservoir basin at 10 ft.—5 ft. intervamile 2. Survey of dam site by a 32"—1 mile 500 acres 3. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft. 4. Soil surveys and burrow 5. Model experiments by In  K. Buildings.— Temporary buildings	by a ls on ir ph s at I s for tun surv	ir pho a sca otogra Rs. 4 p found nelling	tograp le of 4 uphy a per aci ations g etc.	ohy and grees of dainclud	d grod mile ound s m and ling te	139 s survey d rese	q, mi , and ,	les at plotti	Rs. 3	75 po	er sq. le of core of 50	50 6,00 80,00 1,35,00 9,94,37 19,88 10,14,26 95,37 4,33,0g 15,42,67 2,00 30,00 1,00 2,00 87,1
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  I. TOOLS AND PLANT  III ESTABLISHMENT  I. WORKS—  1. Dams and appurtenant work  A. Preliminary Expenses—  1. Survey of reservoir basin at 10 ft.—5 ft intervamile  2. Survey of dam site by a 32"—1 mile 500 acres  3. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft.  4. Soil surveys and burrow  5. Model experiments by In  K. Buildings.—  Temporary buildings  Main Canals and Branches.—	by a ls on	ir pho a sca cotogra Rs. 4 p found nelling reys . a Wate	tographe of 4 aphy aper across ations geto.	ohy and grees of dainclud	ad grown and some and	139 s survey d rese esting	eq. mi v and rvoir 30 1	les at  plotti  basin  vos. b	Rs. 3	75 po	er sq. le of core of 50 L.S.	500 80,000 1,35,000 9,94,37 19,88 10,14,26 95,37 4,33,04 15,42,67 52,19 2,000 30,00 1,00 2,000 87,1
Electric load surveys Froperty surveys Communications Communicatio	by a ls on	ir pho a sca cotogra Rs. 4 p found nelling reys . a Wate	tographe of 4 aphy aper across ations geto.	ohy and grees of dainclud	ad grown and some and	139 s survey d rese esting	eq. mi v and rvoir 30 1	les at  plotti  basin  vos. b	Rs. 3	75 po	er sq. le of core of 50 L.S.	500 6,000 80,000 1,35,000 9,94,37 19,88 10,14,26 95,37 4,33,04 15,42,67 52,19 2,000 30,000 1,000 2,000 87,11 25,00
Electric load surveys  Property surveys  Communications  Special Tools and Plant  2 % contingencies  Total Works  I. TOOLS AND PLANT  III ESTABLISHMENT  I. WORKS—  1. Dams and appurtenant work  A. Preliminary Expenses—  1. Survey of reservoir basin at 10 ft.—5 ft intervamile  2. Survey of dam site by as 32"—1 mile 500 acres  3. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft.  4. Soil surveys and burrow  5. Model experiments by In  K. Buildings.—  Temporary buildings  Main Canals and Branches.—  1. Survey of the commande  2. Miscellaneous surveys	by a ls on	ir pho a sca . otogra Rs. 4 p found nelling reys . a Wata	tographe of 4 sphy aper across geto	ohy and grees of da includes Stati	and groot mile on mile on manufacture on Po	139 s survey . d rese esting . cons.	q and	les at plotti basin Nos. b	Rs. 3	a sca pring, each	er sq. le of . core of 50 . L.S	500 6,000 80,000 1,35,000 9,94,37 19,88 10,14,26 95,37 4,33,04 15,42,67 52,15 2,000 30,00 1,00 2,000 87,1 25,00 6,18,7
i. Electric load surveys i. Property surveys i. Communications 7. Special Tools and Plant  2 % contingencies Total Works II. TOOLS AND PLANT III ESTABLISHMENT  I. WORKS— 1. Dams and appurtenant work A. Preliminary Expenses— 1. Survey of reservoir basin at 10 ft.—5 ft. intervamile 2. Survey of dam site by a 32"—1 mile 500 acres 3. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft. 4. Soil surveys and burrow 5. Model experiments by In  K. Buildings.— Temporary buildings Main Canals and Branches.— 1. Survey of the commande 2. Miscellaneous surveys 3. Explorations for foundat	by a ls on	otografication a sca otografication of the scale otografication of the scale of the scale of the scale otografication of the scale of the scale of the scale of the scale of the scale of t	tographe of 4  uphy aper across geto.  arways  Canal	ohy and grees of da includes Stati	and groot mile out of mile out of the manufacture o	139 s survey . d rese esting . cons.	q and	les at plotti basin Nos. b	Rs. 3	a sca pring, each	er sq. le of . core of 50 . L.S L.S.	500 6,00 80,000 1,35,000 9,94,37 19,88 10,14,26 95,370 4,33,04 15,42,67 2,00 30,00 1,00 2,00 87,1: 25,00 6,18,70 5,00
1. Electric load surveys 2. Property surveys 3. Communications 4. Special Tools and Plant 2 % contingencies 5. Total Works 6. Total Works 6. II. TOOLS AND PLANT 6. III ESTABLISHMENT 6. III ESTABLISHMENT 6. Dams and appurtenant work 6. Preliminary Expenses 6. Survey of reservoir basin at 10 ft.—5 ft. intervamile 6. Survey of dam site by an 32"—1 mile 500 acres 6. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft. 6. Soil surveys and burrow 6. Model experiments by In 6. Buildings.— 7. Temporary buildings 6. Main Canals and Branches. 6. Miscellaneous surveys 6. Explorations for foundat	by a ls on	otografication a sca otografication of the scale otografication of the scale of the scale of the scale otografication of the scale of the scale of the scale of the scale of the scale of t	tographe of 4  uphy aper across geto.  arways  Canal	ohy and grees of da includes Stati	and groot mile out of mile out of the manufacture o	139 s survey . d rese esting . cons.	q and	les at plotti basin Nos. b	Rs. 3	a sca pring, each	er sq. le of . core of 50 . L.S	50(6,00) 80,00(1,35,00) 1,35,00(1,35,00) 9,94,37 19,88 10,14,26 95,37(4,33,04 15,42,67  52,12 2,00 30,00 1,00 2,00 87,1: 25,00 6,18,76 5,00 25,00
II. TOOLS AND PLANT.  III ESTABLISHMENT.  I. WORKS—  1. Dams and appurtenant work  A. Preliminary Expenses—  1. Survey of reservoir basin at 10 ft.—5 ft. intervamile  2. Survey of dam site by a 32"—1 mile 500 acres  3. Geological investigations drilling, making drifts, Rft. at Rs. 20 per Rft.  4. Soil surveys and burrow  5. Model experiments by Interval of the commands  K. Buildings.—  Temporary buildings  Main Canals and Branches.—  1. Survey of the commands  2. Miscellaneous surveys	by a ls on	otograms. 4 property of the control	tographe of 4  uphy aper across geto.  arways  Canal	ohy and grees of da includes Stati	and groot mile out of mile out of the manufacture o	139 s survey . d rese esting . cons.	q and	les at plotti basin Nos. b	Rs. 3	a sca pring, each	er sq. le of . core of 50 . L.S L.S.	500 6,000 80,000 1,35,000 9,94,37 19,881 10,14,26; 95,370 4,33,04 15,42,67 52,12 2,00 30,00 1,00 2,00 87,13 - 25,00 6,18,78 5,00 25,00 11,0

3. Malaria Surveys										L.S.	Rs. 1,000
4. Electric load survey	•	•	•	•	•	•	•	•		L.S.	500
5. Property surveys 139 sq. miles	s at R	s. <b>4</b> 3/	- per sq	. mi	le .	•			•		6,000
6. Communications Constructing and maintaining	for 3 y	ears 1	tempor	ary r	oads			•		L.S.	80,000
<ol> <li>Special Tools and Plant</li> <li>2 Diamond drills complete with</li> </ol>	a acces	sories	at Rs.	60,0	00 еас	h.			•	•	1,20,000
<ol><li>Testing apparatus and laborat testing soils for shear stren</li></ol>	ory eq	uipm ptımı	ent for um m	com oistu	pressi ire co	ve str ontent	ength and	of ro	eks s olidat	and ion	
etc	•	•	•	•	•		•	•	•	L.š	15,000
										-	1,35,006
2 % contingencies							٠			٠.	9,9 <b>4,2</b> 7 <i>5</i> 19,888
Total	Work	<b>s</b> .	•		•		•		•		10,14,268
I. TOOLS AND PLANT.—											
1. Motor vehicles for survey part	ties 3 1	Tos. e	t Rs. 7	,000	each						21,00 €
2. Working expenses for above for	or 3 ye	ars									22,500
3. Scientific Instruments .										•	30,000
4. Ordinary Tools and Plant			•		•						2,500
5. Camp equipage	•	•	•	•			•				7,500
6. Office furniture			•								10,006
99/ continuoscies											93,500 1,870
2% contingencies		٠,	••	•	••	•	•	•	•	. –	95,870
II. ESTABLISHMENT.— Cost of 1 Division for 3 years—8,	48 A00	. KU 0	/ ohera	ashla	to T	2786					4,83,044
3. Estimate for the prelimina	ary si	urvez	js and	inv	e <b>st</b> ige	ıtion.	s for	a des	m si	te on t	the Narbado
3. Estimate for the prelimina River near Punasa, for purpose	ary si es of j	urvez flood	s and	l inv ol ar	estige rd ger	ution. nerat	s for ing h	a da ydro	m si eleci	te on t	the Narbado wer.
River near Punasa, for purpos	ary si es of j	urvez Aood	s and contro Abst	ol ar	e <b>st</b> ige n <b>d g</b> en	ation. nerat	s for ing h	a den ydro	m si eleci	te on t tric po	the Narbado wer.
River near Punasa, for purpose. . WORKS.—	ary si es of J	urvez Aood	contr	ol ar	e <b>st</b> ige n <b>d g</b> en	ation. nerat	s for ing h	a dar ydro	m si -eleci	te on t	wer.
River near Punasa, for purpos	ary si es of j	urvez Rood	contr	ol ar	e <b>sti</b> ge n <b>d g</b> er	ation. nerat	s for ing h	a dar ydro	m si -eleci	te on t	rs.
River near Punasa, for purpose.  . Works.—	ary si es of j	urvez Aood	contr	ol ar	estiga nd gen	ution nerat	s for ing h	a dan ydro	m si eleci	te on t tric po	nwer. Ra. 3,04,500
River near Punasa, for purpose  . WORKS.—  1. Dams and appurtenant works	ary si es of j	urvez flood •	contr	ol ar	estige id ge	ition nerat	s for ing h	a dan ydro	m si elect	te on thric po	Ra. 3,04,500 30,000
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1 9 diamond drille c	omplete wit	h acc	essor	ies at	Rs. 60	0,000	each	*	•	•			1,20,000
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dation, etc.	•	•	•	•	•	•	•						1,45,000
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Scientific instrumen		•	•	•	•	•	•	•	•	*	•	•	500
Ordinary Tools and	Plant	•	•	•	•	•	•	•	•	•			1,500
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of a Pick-up Wei from the weir for  I. WORKS.—  1. Dams and Appropriate A. Preliminary R. Buildings  2. Main Canals and R. Communication  II. TOOLS AND P. III. ESTABLISHM  I. WORKS.—  1. Bams and appropriate A. Preliminary  1. Survey of  82"=1 12  2. Geologica including  3. Model Ext.  K. Buildings.— Temporary Bu	r at the enr purpose r purpose urtenant wo Expenses d Branches s 2% conti Total Wo LANT . Total . Tota	d of of orks	the Live of the li	tappigatio	pla (on. Abs.	tract  ails  are fewer depth	., and	rveys	and p	right	g on a . drilling. 20 p	scale of getc.	Rs. 28,000 15,00 5,94,50 20,00 6,57,55 13,14 6,70,61 3,46,44 11,02,26
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of a Pick-up Weifrom the weir for the weir for I. WORKS.—  1. Dams and Appropriate A. Preliminary R. Buildings  2. Main Canals and R. Communication  H. TOOLS AND P. HI. ESTABLISHM  I. WORKS.—  1. Bams and appropriate A. Preliminary  1. Survey of 82"=11  2. Geologica including  3. Model Ext.  K. Buildings.—  Temporary But  2. Main Canals and  1. Survey of communication	r at the enr purpose r purpose urtenant wo Expenses d Branches s 2% conti Total Wo LANT . IENT . Total . Total . Expenses.— Expenses.— Expenses.— Investigat g testing. cperiments b mildings d Branches.— commanded are	of of of the state	the Live of the li	graph gatio	Detains and acre tach of ways,	tract  ails  f weith depth	and sund sund site to 50'—nn, Po	rveys by b	and p	right.	g on a drilling. 20 p	scale of getc. ar Rft S.	Rs. 28,000 15,00 5,94,50 20,00 6,57,56 13,14 6,70,61 3,46,41 11,02,21
of a Pick-up Weifrom the weir for  I. WORKS.—  1. Dams and Appropriate A. Preliminary R. Buildings  2. Main Canals and R. Communication  II. TOOLS AND P. HI. ESTABLISHM  I. WORKS.—  1. Bams and appropriate A. Preliminary  1. Survey of 82"=11  2. Geologica including  3. Model Ext.  K. Buildings.—  Temporary But  2. Main Canals and  1. Survey of communication	r at the enr purpose r purpose urtenant wo Expenses d Branches s 2% conti Total Wo LANT Total Total urtenant wor Expenses.— weir site b mile, 500 acr l Investigat g testing. rperiments b mildings d Branches. manded are s surveys	of of of the state	the live of irred	gatio	Detains and acre tion of ways,	tract  ails  f weith depth  static	and sund sund state of the stat	rveys by b-1,25	and p	right.	g on a drilling. 20 p	scale of g etc. er Rft S.	Rs. 28,000 15,00 5,94,50 20,00 6,57,56 13,14 6,70,61 3,46,41 11,02,22 11,02 28,0 15,0 5,62,8 7,6
of a Pick-up Wei from the weir for  I. WORKS.—  1. Dams and Appropriate A. Preliminary R. Buildings  2. Main Canals and R. Communication  H. TOOLS AND P.  HI. ESTABLISHM  I. WORKS.—  1. Bams and appropriate A. Preliminary  1. Survey of 82"=11  2. Geologica including  3. Model Ext.  K. Buildings.—  Temporary Bu  2. Main Canals and  1. Survey of communication	r at the enr purpose r purpose urtenant wo Expenses d Branches s 2% conti Total Wo LANT Total  Total  "Expenses.— " weir site b mile, 500 acn al Investigat g testing. reperiments b mildings d Branches. manded are s surveys for foundat	of of orks  ingen  rks  vy air  res at the control of the control	the live of cross of	gatio	Detains and acre tion of ach of ways,	tract  ails  grounding  f weith	and sund sund state of the stat	rveys by b-1,25	and p	right.	g on a drilling. 20 p	scale of getc. ar Rft S.	Rs. 28,090 15,000 5,94,500 20,000 6,57,66 13,14 6,70,65 11,02,28

				č	o o							
3. Communications—												Rs.
Constructing temporary	roads and n	aıntai	ining	them	for 3	years	3	•	•	. L.c.		26,000
2% o	ontingencies			•								6,57,500 13,150
	Tetal Worl	KS.	•	•	•					,		6,70,650
<b>T</b>												
II. TOOLS AND PLANT		•										
Motor vehicles for surve		los. at	Rs.	7,000	each		•	•	•	•	•	21,000
Working expenses for	years .	•	•	•	•	•	•	•	•	•	•	22,500
Scientific Instruments	• •	•	•	•	٠	•	•	•	•	•	•	24,000
Ordinary Tools and Plan	at .	•	•	•	•	•	•		•			2,000
Camp equipage .		•	•			•		•		•		6,000
Office furniture .		•	•	•		•	•		•	•	•	8,000
2%	contingenci	<b>8</b> 8						_				83,500 1,670
- 70			•	·	•	•	•	•	•	•	***************************************	85,170
III. ESTABLISHMENT												00,110
Cost of 1 Division for 3	<b>y</b> ears 8,66,08	38. 40	0% o	harge	able to	Bros	ich Pi	oject	•	•	•	3,46,435
w 77 (* , 6 , 7	7.		. •		~							
5. Estimate for the Projects for the Mult	general in i i-murnose	estige Dene	ation Loca	ns an	d sur	veys Na	in th	e wh	ole be	asin in	connec	tion with
1 10 Jours John 1100 111 11100	-par pose	Deve			-	2 14 16	1000	и ви	3111.			
I. WORKS—				Abstr	act							Rs.
1. Discharge and Silt O	bservations						_					2,00,000
2. Meteorological Obser												25,800
3. Mineral Surveys .				•								10,000
4. Surveys for Piscicult	ure .			•								2,000
5. Surveys for Navigati				•	•							1,00,000
6. Economic Surveys]						•			•			25,000
7. Surveys for soil erosi	on .		•	•		•			-	•	•	7,500
~ 90.	contingenc	iaa										3,70,300
<u>.</u> "		100	•	•	•	•	•	•	•	•	•	7,406
То	tal .	•	•	•	•	•	•	•	•	•	•	3,77,706
				Deta	ils							
I. WORKS. —												
1. Discharge and silt ob												
One boatman and for floats, gauges,								f rope	s, dis	charge ro	ds,	
10 sites (8 on Na for 4 years	rbada and 2	at Ta	wa s	ad Bu	nhuer	) at F	ks. 5,0	00 pe	r site	per yea	•	2,00,000
2. Meteorological Observ. Raingauges Tempera				nd ve	locity	obser	vation	18.				
(i.) Equipment and grated self-red at an average	ording type	humi	new idity	rain and v	gaugas wind v	s (som relocit	e of t y ap	hese t paratu	o be d	of the int 5 station	6⊖- & •	15,000
(ii.) Recurring exp	enditure on	part-t	time •	obser	vers.	15 ol	oserve	ers at	Rs. 1	5 p.m. :	for •	10,800
							•					2,25,800
3. Mmeral Surveys .	•	•	•	•	•	•	•	•	•	. L.S		10,000
4. Surveys for Piscicult	ure	•	•	•	•	•	•	•	•	. L.S.		2,000
5 Surveys for Navigati	on.	•	•	٠	•	•	•	•	•	. L.S	•	1,00,000
6. Economic Surveys		•	•	•	•	•	•	•	•	. L.S.		25,000
7. Surveys for soil eros	ion	•	•	•	•	•	•	•	•	. L.S.	•	7,500
20	% contingenc	ies					•			•		3,70,300 7,406
,	otal Works	_		_	_					•		3,77,706
.10	TOT AL CITY	•	•	•	•	•	•	•	•	•	_	

Details of the establishment of the two Divisions provided for in the preceding five estimates.

4 Dearness Allowance for establishment	esi	tim <b>a</b> tes.										
2 Executive Engineers @ Rs. 675 p.m. 21,000 4 Asstt. Executive Engineers @ Rs. 600 p.m. 28,800 4 Asstt. Engineers @ Rs. 560 p.m. 10,500 2 Asstt. Geologists @ Rs. 875 p.m. 10,500 2 Asstt. Geologists @ Rs. 750 p.m. 12,000 1 Officer to conduct seonomic surveys @ Rs. 550 p.m. 12,000 1 Officer to conduct seonomic surveys @ Rs. 550 p.m. 12,000 2 Paly of Establishment. 8 Rs. 1000 p.m. 1 No. at Rs. 1,000 p.m. 12,000 2 Paly of Establishment. 8,640 3 Accountants @ Rs. 240 p.m. 4,800 2 Head Clerks @ Rs. 180 p.m. 4,820 5 Senior Clerks @ Rs. 180 p.m. 4,820 5 Senior Clerks @ Rs. 180 p.m. 10,800 2 Storekeepers @ Rs. 150 p.m. 1,624 2 Senior Clerks @ Rs. 180 p.m. 15,624 2 Senior Clerks @ Rs. 180 p.m. 15,624 2 Senior Dearfrunce @ Rs. 200 p.m. 4,800 2 Tracets @ Rs. 101 p.m. 4,992 2 Sub. Asstt. Surgeons @ Rs. 170 p.m. 4,992 2 Compounders @ Rs. 50 p.m. 1,200 32 Overseers @ Rs. 104 p.m. 1,200 32 Overseers @ Rs. 240 p.m. 1,200 33 Laboratory Asstts. @ Rs. 240 p.m. 1,200 34 Sub. Likit Analysts @ Rs. 93 p.m. 1,200 35 Laboratory Asstts. @ Rs. 230 p.m. 1,200 36 Bascarda @ Rs. 33 p.m. 1,200 37 Darness Allowance for establishment 10 Chowkidars @ Rs. 33 p.m. 1,200 38 Dearness Allowance for establishment 10 Chowkidars @ Rs. 33 p.m. 1,200 39 T. A. for establishment 11 Division per year 5,77,892  Cost of establishment of 1 Division per year 5,77,892		1. Pay of Officers	Detail:	s of es	tablis	hment	of th	e two	Divisi	ons		year
Asstt. Engineers @ Rs. 560 p.m.   10,500     Geologist @ Rs. 375 p.m.   10,500     Asstt. Geologist @ Rs. 570 p.m.   12,000     Officer to conduct economic surveys @ Rs 550 p.m.   12,000 p.m.   12,000     Dill Foreman @ Rs. 1000 p.m.   1 No. at Rs. 1,000 p.m.   12,000     2. Pay of Establishment.   8,640     3. Afetcorological Assits. @ Rs. 240 p.m.   4,800     4. Accountants @ Rs. 200 p.m.   4,800     5. Head Clerks. @ Rs. 150 p.m.   4,800     5. Storick epers @ Rs. 150 p.m.   10,800     5. Storick epers @ Rs. 150 p.m.   15,624     5. Storick epers @ Rs. 150 p.m.   1,200     6. Storick epers @ Rs. 150 p.m.   1,200     7. Storick epers @ Rs. 143 p.m.   4,992     8. Sub. Assit. Surgeons @ Rs. 170 p.m.   1,200     9. Compounder: @ Rs. 50 p.m.   1,200     10. Compounder: @ Rs. 50 p.m.   1,200     10. Compounder: @ Rs. 50 p.m.   1,200     10. Cilt Analysis @ Rs. 240 p.m.   1,230     10. Elit Analysis @ Rs. 240 p.m.   1,230     10. Senior Oberivers @ Rs. 30 p.m.   1,230     10. Senior Oberivers @ Rs. 30 p.m.   1,230     10. Barkandaz @ Rs. 33 p.m.   1,230     10. Barkandaz @ Rs. 33 p.m.   1,230     10. Daffadars @ Rs. 33 p.m.   1,230     10. Chowkidars @ Rs. 33 p.m.   2,232     10. Laboratory khalasis @ Rs. 33 p.m.   2,232     10. Laboratory khalasis @ Rs. 33 p.m.   2,234     10. Chowkidars @ Rs. 33 p.m.   3,960     10. Chowkidars @ Rs. 33 p.m.   3,960     11. T.A. for officers   4,000     12. Cost of Project circle office debited to Narbada   33,000     13. Cost of establishment of 1 Division per year   5,77,392	2	Executive Engineers @ R < . 875 p.m										
1 Geologist @ Rs. 875 p.m. 10,500 2 Asstt. Geologist @ Rs. 500 p.m. 12,000 1 Officer to conduct sonomic surveys @ Rs 550 p.m. 1 Drull Foreman @ Rs. 1000 p.m. 1 No. at Rs. 1,000 p.m. 12,000 2. Pay of Establishment. 8,840 p.m. 8,840 2 Accountants @ Rs. 200 p.m. 4,800 2 Head Clarks @ Rs. 200 p.m. 4,800 2 Head Clarks @ Rs. 150 p.m. 10,800 2 Storekeepers @ Rs. 150 p.m. 10,800 2 Storekeepers @ Rs. 150 p.m. 3,600 14 Junior Clarks @ Rs. 200 p.m. 4,800 2 Junior Draftrunen @ Rs. 143 p.m. 4,800 2 Junior Draftrunen @ Rs. 143 p.m. 4,800 2 Junior Draftrunen @ Rs. 143 p.m. 4,800 2 Sub. Asstt. Surgeons @ Rs. 170 p.m. 1,490 2 Sub. Asstt. Surgeons @ Rs. 170 p.m. 4,902 2 Sub. Asstt. Surgeons @ Rs. 170 p.m. 1,200 32 Overscers @ Rs. 240 p.m. 1,200 32 Overscers @ Rs. 240 p.m. 1,200 31 Clark Analysts @ Rs. 240 p.m. 1,200 31 Laboratory Asstts. @ Rs. 230 p.m. 1,200 32 Laboratory Asstts. @ Rs. 230 p.m. 1,200 3 Laboratory Asstts. @ Rs. 230 p.m. 1,200 3 Laboratory Asstts. @ Rs. 230 p.m. 1,200 3 Daffadars @ Rs. 33 p.m. 1,200 4 Daffadars @ Rs. 33 p.m. 1,200 5 Daffadar	4	Asstt. Executive Engineers @ Rs. 600 p.r	n.									28,800
2 Asstt. Geologists @Rs. 500 p.m. 1 12,000 1 Officer to conduct economic surveys @Rs. 550 p.m. 1 No. at Rs. 1,000 p.m. 12,000 Rs. 550 p.m. 1 Drdl Foreman @Rs. 1000 p.m. 1 No. at Rs. 1,000 p.m. 12,000 2. Pay of Establishment. 3,640 2. Pay of Establishment. 3,640 2. Accountants @Rs. 200 p.m. 4,800 2. Head Clerk: @Rs. 150 p.m. 4,800 2. Head Clerk: @Rs. 150 p.m. 10,800 2. Storekeepers @Rs. 150 p.m. 3,600 14 Junior Clorks @Rs. 93 p.m. 15,634 2. Senior Deraftsunen @Rs. 200 p.m. 4,800 2. Storekeepers @Rs. 150 p.m. 3,400 2. Storekeepers @Rs. 150 p.m. 1,800 2. Sunior Deraftsunen @Rs. 240 p.m. 4,800 2. Sunior Deraftsunen @Rs. 143 p.m. 4,902 2. Sulb. Asstt. Surgeons @Rs. 170 p.m. 4,902 2. Sulb. Asstt. Surgeons @Rs. 170 p.m. 1,200 2. Compounyler: @Rs. 55 p.m. 1,200 2. Overscers @Rs. 240 p.m. 1,200 2. Overscers @Rs. 240 p.m. 1,200 2. Laboratory Asstts. @Rs. 240 p.m. 1,200 2. Laboratory Asstts. @Rs. 230 p.m. 1,800 2. Asstt. Silt Analysts @Rs. 230 p.m. 1,800 2. Daffadars @Rs. 33 p.m. 1,800 2. Daffadars @Rs. 33 p.m. 1,800 2. Daffadars @Rs. 33 p.m. 1,800 3. Dearness Allowance for establishment 1,237 4. Chowkidars @Rs. 33 p.m. 1,237 5. T.A. for officers 1,237 5. T.A. for officers 1,24,112 5. Cost of Project circle office debited to Narbada 3,300 5. Establishment ontingencies 2,000 5. T.A. for establishment of 1 Division per year 5,77,392	4	Asstt. Engineers @ Rs. 560 p.m										26,880
1 Officer to conduct economic surveys @ Rs 550 p.m. 1 Drill Forman @ Rs, 1000 p.m. 1 No. at Rs. 1,000 p.m. 12,000  2. Pay of Establishment. 8,640 2. Pay of Establishment. 8,640 2. Head Clerks @ Rs. 240 p.m. 4,800 2. Head Clerks @ Rs. 150 p.m. 10,800 2. Storekeepers @ Rs. 150 p.m. 10,800 2. Storekeepers @ Rs. 150 p.m. 10,800 2. Storekeepers @ Rs. 150 p.m. 15,804 2. Senior Clerks @ Rs. 93 p.m. 15,824 2. Senior Deraftsmen @ Rs. 200 p.m. 4,800 2. Junior Draftsmen @ Rs. 143 p.m. 4,900 2. Junior Draftsmen @ Rs. 143 p.m. 4,902 2. Junior Draftsmen @ Rs. 143 p.m. 4,992 2. Sub. Assit. Surgeons @ Rs. 170 p.m. 92,180 2. Compounder: @ Rs. 250 p.m. 1,200 2. Compounder: @ Rs. 240 p.m. 1,200 2. Compounder: @ Rs. 240 p.m. 1,200 2. Contactory Assits. @ Rs. 240 p.m. 1,2200 2. Itabratory Assits. @ Rs. 240 p.m. 1,2200 2. Lita Analysis @ Rs. 230 p.m. 1,2300 2. Cilt Analysis @ Rs. 230 p.m. 1,2300 2. Daffadars @ Rs. 33 p.m. 1,2300 3. Dearness Allowance for establishment 1,2300 3. Establishment of 1 Division per year 5,77,392	1	Geologist @ Rs. 875 p.m										10,500
Rs 550 p.m.   1 Drill Foreman @ Rs, 1000 p. m.   1 No. at Rs. 1,000 p.m.   12,000	2	Asstt. Geologists @Rs. 500 p.m										12,000
2. Pay of Establishment.  3. Meteorological Assita. @ Rs. 240 p.m	1											6,600
2. Pay of Establishment.  3. Meteorological Assits. @ Rs. 240 p.m	1	Drill Foreman @ Rs. 1000 p. m	l No	. at R	s. 1,0	00 p.r	n.					
2 Accountants & R., 200 p.m.       4,800         2 Head Clerk, & R., 180 p.m.       4,320         5 Senior Clerks & R., 150 p.m.       10,800         2 Storekeepers & R., 150 p.m.       3,600         14 Junior Clerks & R., 93 p.m.       15,624         2 Senior Deraftsunen & R., 200 p.m.       4,800         2 Junior Draftsunen & R., 200 p.m.       4,800         2 Junior Draftsunen & R., 104 p.m.       4,992         2 Sith Assit, Surgeons & R., 170 p.m.       4,992         2 Sith Assit, Surgeons & R., 170 p.m.       1,200         32 Overscers & R., 240 p.m.       92,160         6 Research Assits, & R., 240 p.m.       92,160         7 Indicate a R., 200 p.m.       1,280         2 Sith Analysis & R., 200 p.m.       4,800         2 Satt. Silt Analysis & R., 200 p.m.       4,800         2 Assit, Silt Analysis & R., 200 p.m.       2,232         10 Senior Observers & R., 20 p.m.       3,400         2 Assit, Silt Analysis & R., 39 p.m.       10,800         2 Daffadars & R., 33 p.m.       702         10 Barkandaz & R., 33 p.m.       3,960         14 Peons & R., 33 p.m.       3,960         2 Laboratory khalasis & R., 33 p.m.       2,24,112         3 Dearness Allowance for officers       16,020		2. Pay of Establishment.									1	,17,780
2 Head Clerks. @ Rs. 180 p.m. 10,800 2 Storekeepers @ Rs. 150 p.m. 10,800 2 Storekeepers @ Rs. 150 p.m. 15,624 2 Sentor Deraftsmen @ Rs. 290 p.m. 4,800 2 Junior Clerks @ Rs. 133 p.m. 3,432 4 Tracets @ Rs. 143 p.m. 4,992 2 Sub. Asstt. Surgoons @ Rs. 170 p.m. 4,992 2 Sub. Asstt. Surgoons @ Rs. 170 p.m. 1,200 3 Oversoons @ Rs. 240 p.m. 92,160 6 Research Asstts. @ Rs. 240 p.m. 17,280 2 Ichoratory Asstts. @ Rs. 230 p.m. 5,520 2 Elit Analysis @ Rs. 200 p.m. 4,800 2 Asstt. Sult Analysis @ Rs. 93 p.m. 8,400 10 Senior Observers @ Rs. 39 p.m. 10,800 2 Daffadars @ Rs. 39 p.m. 10,800 2 Daffadars @ Rs. 39 p.m. 10,800 2 Daffadars @ Rs. 39 p.m. 10,800 3 Dearness Allowance for officers 16,020 4 Dearness Allowance for establishment 5 T.A. for officers 40,000 5 T.A. for establishment of 1 Division per year 5,77,392	3	Meteorological Assits. @ Rs. 240 p.m										8,640
1,800   2   Storekeepers @ Rs. 150 p.m.   10,800   2   Storekeepers @ Rs. 150 p.m.   3,600   14   Junior Clocks @ Rs. 93 p.m.   15,624   2   Senior Deraftsinen @ Rs. 200 p.m.   4,800   2   Junior Draftsinen @ Rs. 143 p.m.   4,992   3,432   4   Tracers @ Rs. 104 p.m.   4,992   2   Sub. Assit. Surgeons @ Rs. 170 p.m.   4,080   2   Compounder @ Rs. 50 p.m.   1,200   32   Overscers @ Rs. 240 p.m.   92,160   6   Research Assits. @ Rs. 230 p.m.   17,280   2   Elit Analysis @ Rs. 230 p.m.   4,800   2   Assit. Sult Analysis @ Rs. 230 p.m.   4,800   2   Assit. Sult Analysis @ Rs. 93 p.m.   2,232   10   Jauge Readers @ Rs. 70 p.m.   8,400   10   Senior Obseivers @ Rs. 90 p.m.   10,800   2   Daffadars @ Rs. 33 p.m.   792   10   Barkandaz @ Rs. 33 p.m.   3,960   14   Peons @ Rs. 33 p.m.   3,960   10   Chowkidars @ Rs. 33 p.m.   2,376   10   Chowkidars @ Rs. 33 p.m.   3,960   10   Cho	2	Accountants @ Rs. 200 p.m										4,800
10,800   2   Storekeepers @ Rs. 150 p.m.   3,600   14   Junior Clocks @ Rs. 93 p.m.   15,624   2   Senior Deraftsmen @ Rs. 200 p.m.   4,800   2   Junior Draftsmen @ Rs. 143 p.m.   4,800   2   Junior Draftsmen @ Rs. 143 p.m.   4,992   4   Tracets @ Rs. 104 p.m.   4,992   2   Sub. Assett. Surgeons @ Rs. 170 p.m.   4,080   2   Compounders @ Rs. 50 p.m.   1,200   32   Overscers @ Rs. 240 p.m.   92,160   6   Research Assetts @ Rs. 240 p.m.   1,280   2   Taboratory Assetts @ Rs. 240 p.m.   5,552   2   Elit Analysis @ Rs. 230 p.m.   4,800   2   Assett. Sult Analysis @ Rs. 230 p.m.   4,800   2   Assett. Sult Analysis @ Rs. 93 p.m.   2,232   10   Senior Obseivers @ Rs. 90 p.m.   8,400   10   Senior Obseivers @ Rs. 90 p.m.   10,800   2   Daffadars @ Rs. 33 p.m.   3,960   14   Peons @ Rs. 33 p.m.   3,960   14   Peons @ Rs. 33 p.m.   3,960   10   Chowkidars @ Rs. 33 p.m.   2,276   10   Chowkidars @ Rs. 33 p.m.   3,960   10	2	Head Clerks @ Rs. 190 p.m.	-									4,320
14 Junior Clorks @ Rs. 93 p.m	(5	Senior Clerks @ Rs. 150 p.m										10,800
14 Junior Clorks @ Rs. 93 p.m	2	Storekeepers @ Rs. 150 p.m										3,600
2 Senior Deraftsmen @ Rs. 200 p.m												15,624
2 Junior Draftsmen @ Rs. 143 p.m												4,800
2 Sub. Asstt. Surgeons @ Rs. 170 p.m.       4,080         2 Compounders @ Rs. 50 p.m.       1,200         32 Overseers @ Rs. 240 p.m.       92,160         6 Research Asstts. @ Rs. 240 p.m.       17,280         2 I aboratory Asstts. @ Rs. 230 p.m.       5,520         2 Elit Analysts @ Rs. 200 p.m.       4,800         2 Asstt. Silt Analysts @ Rs. 93 p.m.       2,232         10 Jauge Rearlers @ Rs. 70 p.m.       8,400         10 Senior Observers @ Rs. 90 p.m.       10,800         2 Daffadars @ Rs. 33 p.m.       792         10 Barkandaz @ Rs. 33 p.m.       3,960         14 Peons @ Rs. 33 p.m.       2,376         10 Chowkidars @ Rs. 33 p.m.       3,960         2 Dearness Allowance for officers       16,020         4 Dearness Allowance for establishment       66,480         5 T.A. for officers       40,000         6 T.A. for establishment       60,000         7 Cost of Project circle office debited to Narbada       33,000         8 Establishment contingencies       20,000         Cost of establishment of 1 Division per year       5,77,392												3,432
2 Sub. Asstt. Surgeons @ Rs. 170 p.m	4.	Tracers @ Rs. 104 p.m										4,992
2 Compounders @ Rs. 50 p.m.       1,200         32 Oversoers @ Rs. 240 p.m.       92,160         6 Research Assits. @ Rs. 240 p.m.       17,280         2 I aboratory Assits. @ Rs. 230 p.m.       5,520         2 Ellt Analysts @ Rs. 200 p.m.       4,800         2 Assit. Silt Analysis @ Rs. 93 p.m.       2,232         10 Jauge Readers @ Rs. 70 p.m.       3,400         10 Senior Observers @ Rs. 90 p.m.       10,800         2 Daffadars @ Rs. 33 p.m.       792         10 Barkandaz @ Rs. 33 p.m.       3,980         14 Peons @ Rs. 33 p.m.       2,376         10 Chowkidars @ Rs. 33 p.m.       3,980         2 Dearness Allowance for officers       16,020         4 Dearness Allowance for establishment       66,480         5 T.A. for efficers       40,000         6 T.A. for establishment       60,000         7 Cost of Project circle office debited to Narbada       33,000         8 Establishment contingencies       20,000         Cost of establishment of 1 Division per year       5,77,392	2											4,080
32 Overscers @ Rc. 240 p.m.   92,160		- · · · · · · · · · · · · · · · · · · ·										
6 Research Assits. @ Rs. 240 p.m												-
2 ! aboratory Assttr. @ Rs. 230 p.m.       5,520         2 ! Silt Analysts @ Rs. 200 p.m.       4,800         2 Asstt. Silt Analysts @ Rs. 93 p.m.       2,232         10 ! auge Readers @ Rs. 70 p.m.       8,400         10 Senior Observers @ Rs. 90 p.m.       10,800         2 Daffadars @ Rs. 33 p.m.       792         10 Barkandaz @ Rs. 33 p.m.       3,960         14 Peons @ Rs. 33 p.m.       5,544         6 Laboratory khalasis @ Rs. 33 p.m.       2,2376         10 Chowkidars @ Rs. 33 p.m.       3,960         2 Dearness Allowance for officers       16,020         4 Dearness Allowance for establishment       65,480         5 T.A. for establishment       60,000         7 Cost of Project circle office debited to Narbada       33,000         8 Establishment contingencies       20,000         Cost of establishment of 1 Division per year       5,77,392          Cost of establishment of 1 Division per year       5,77,392												17,280
2 Ellt Analysts @ Rs. 200 p.m												
2 Asstt. Silt Analysis @ Rs. 93 p.m.       2,232         10 Jauge Readers @ Rs. 70 p.m.       8,400         10 Senior Observers @ Rs. 90 p.m.       10,800         2 Daffadars @ Rs. 33 p.m.       792         10 Barkandaz @ Rs. 33 p.m.       3,960         14 Peons @ Rs. 33 p.m.       5,544         6 Laboratory khalasis @ Rs. 33 p.m.       2,376         10 Chowkidars @ Rs. 33 p.m.       3,960         2,24,112       Dearness Allowance for officers       16,020         4 Dearness Allowance for establishment       66,480         5 T.A. for officers       40,000         6 T.A. for establishment       60,000         7 Cost of Project circle office debited to Narbada       33,000         8 Establishment contingencies       20,000         Cost of establishment of 1 Division per year         5,77,392		·										
10												
10 Senior Observers @ Rs. 90 p.m												
2 Daffadars @ Rs. 33 p.m.       792         10 Barkandaz @ Rs. 33 p.m.       3,960         14 Peons @ Rs. 33 p.m.       5,544         6 Laboratory khalasis @ Rs. 33 p.m.       2,376         10 Chowkidars @ Rs. 33 p.m.       3,960         2,24,112       2         3 Dearness Allowance for officers       16,020         4 Dearness Allowance for establishment       65,480         5 T.A. for officers       40,000         6 T.A. for establishment       60,000         7 Cost of Project circle office debited to Narbada       33,000         8 Establishment contingencies       20,000         Cost of establishment of 1 Division per year			•									•
10 Barkandaz @ Rs. 33 p.m												
14 Peons @ Rs. 33 p.m												
6 Laboratory khalasis @ Rs. 33 p.m												
10 Chowkidars @ Rs. 33 p.m.   3,960												
3   Dearness Allowance for officers												
### Dearness Allowance for establishment											2	2,24,112
5 T.A. for officers	_		•	•	•	•	•	•	•	•	•	16,020
6 T.A. for establishment			•	•	•	•		•	•	•	•	66,480
7 Cost of Project circle office debited to Narbada			•	•	•	•		•	•	•		40,000
8 Establishment contingencies	6		•	•	•	•	•	•	•	•	•	60,000
Cost of establishment of 1 Division per year 5,77,392	-	•	arbada		•	•	•	•	•	•	•	33,000
Cost of establishment of 1 Division per year 5,77,392	8	Establishment contingencies	•	•	•	•	•	•	•	•		20,000
		5,77,392									į	5,77.392

=2,88,696

Cost of 1 Division for 3 years Rs. 8,66,088

G. N. PANDIT

Project Officer, (Nurbada and Tapti.)

#### APPENDIX V

#### TAPTI VALLEY PROJECTS

As in the case of the Narbada, no work for utilising the waters of the Tapti river has so far been executed. This river drains a total area of about 30,000 square miles and approximately 45 million acre feet of water precipitate in the basin during the monsoon months. The entire quantity runs to waste to the sea. The Surat plain often gets flooded causing a lot of damage to life and property. During the last 60 years as many as 15 floods have been reported within this area. The maximum discharge has been calculated to have reached the figure of 900,000 cusecs. Towards the end of the last century a proposal for irrigating lands in the Surat plain was investigated but the scheme did not materialise.

Government of Bombay approached CWINC about a year and a half ago with a request to investigate and formulate schemes which would mitigate the evil of flood and enable the water resources of the basin being utilised for such other beneficial purposes as irrigation, extension of navigation and generation of hydel power. Studies of topographical and hydrological data of the basin were accordingly taken up by the CWINC early in 1947. These studies have revealed that quite a number of suitable sites for development exist in the basin whereby construction of dams of low to medium heights reservoirs can be created for storage of water during monsoons, regulated discharges from which can be utilized for the multipurposes of irrigation and power generation. By allowing a reserve for flood absorption in the lowermost reservoir, floods in the Surat plain can be completely controlled.

For the present it has been decided to investigate only six projects of which four are on the main river and two on the tributaries. Another project on an important tributary Girna is being investigated by the Government of Bombay. Total storage at these sites will amount to about 4.5 million acre feet, slightly less than in the case of the Damodar Valley Projects. A gross area of 12,85,000 will be commanded for irrigation and '63,010 K.Ws. of continuous power generated. Such other benefits as fish culture in the reservoirs, recreational amenities and assurance of adequate domestic water supplies will also accrue to the entire basin with the development of these projects. A list of the projects as well as their details is appended to this note.

The estimate amounting to Rs. 42,25,034 has been prepared to cover the cost of necessary surveys and investigations in order to prepare the projects in detail for execu-It is proposed to set up one division with four subdivisions and requisite number of subordinates and ministerial staff to do the work. Details of the work to be done are shown in the estimate. Topographical surveys of the dam sites, reservoir areas, areas to be commanded for irrigation will be done through the agency of the Survey of India Department. Geological surveys of the dam sites and mineral surveys of the basin will be undertaken in collaboration of the Geological Survey of India. Hydrological surveys will similarly be done in close co-operation with the Indian Meteorological Department. Provisions have also been made for soil surveys of the area to be irrigated and such other items as electrical load surveys, malaria control surveys, fish culture survey and economic and property survey. Necessary staff for geological and other surveys has been provided. It is anticipated that a period of two years will be required to complete all these surveys and investigations. Accordingly staff has been provided for that period. Necessary tools and plant such as survey instruments, core drills, camp requisites have also been provided for.

A statement showing the rough data for the dam sites and the anticipated benefits from the projects is given on page (38). The following maps and charts are enclosed.

- (1) An index map of the Tapti basin showing the proposed dam sites and projects.
- (2) A profile of the Tapti river and its main tributaries.

G. N. Pandit, Project Officer. (Narbada & Tapti.)

# Tapti Basin—Rough Data for the Dam Sites

1. Name of the river . 2. Name of dam site 3. Length along river (miles).	Taptı Atwadhana 91	Tapti Nawtha 259	Tapti Hatnur 315	Tapti Ukai 487	Waghur Bhagpur 44	Panjhra Akalpada 36
	7° 20′ 0″ E ° 49′ 15″ N	76° 27′ 0″ E 21° 26′ 0″ N	75° 57′ 0″ E 21° 3′ 30″ N	73° 35′ 30″ E 21° 15′ 30″ N	75° 42′ 0″ E 20° 56′ 0″ N	20° 57′ 0″ N
5. Catchment area above dam (sq. miles).	1,049	3,100	11,750	23,365	789	510
6. Average rainfall in catchment (inches).	43	41.88	34.42	30.37	80	30
7. Probable mean annual run off. (m. a. ft.)	0.92	1.4	2.5	3 · 43*	0.17	0.108
8. R. L. of river bed .	1,190	800	625	175	730	1,170
9. Proposed F. T. L.	1,340	900	690	400	Not wor	ked out.
10. Maximum neight of dam upto F. T. L. (ft.).	150	100	65	225	Not wor	ked out.
11 Length of dam at F. T. L. (ft.).	2,700	2,640	20,000	. 16,000	Not wor	ked out.
12. Gross capacity of reservoir at F. T. L. (m. a ft.).	0.82	0.56	••	6.19	Not wor	ked out.
13. Fond storage (m. a.	0.11	0.20	• •	1.71	Not wor	ked out.
14. Maximum area of water spread (acres).	11,900	19,400	• •	1,76,000	Not wo	eked out.
15. Losses due to evaporation (5.5 ft. per year) m. a. ft.	0.042	0.075	••	0.49	Not wo	rked out.
16. Reserve for flood control (m. a. ft.).	• •	••	••	1.05	Not wo	rked out.
17. Net Storage available (m. a. ft.).	0.67	0.28	••	2.94	Not wo	rked out.
18. Continuous regulated discherge (cusecs).	890	1,285	1,285	4,000	Not wo	rked out.
19. R. L. o' top of dead storage.	1,252	875	• •	360	Not wo	rked out.
20. R. L. of Tail Race .	1,160	810		195	Not wo	rked out.
21. Average head available for power (ft.).	141	77.5	5	181	Not wo	rked out.
22. Continuous power available (k. w.).	8,360	6,650		48,000	Not wo	rked out.
23. Gross area commanded (acres)	616	••	5,00,000	7,00,000	50,000	35,000
(,	*E	xcluding run-	off intercepted	l above.		
I Total live storage in	pounded		• •		•	m, a. ft.
Il. Total continuous p		ted			. 63,010	k. w.
III. Total gross area co					. 12 85,0	100 acre

.

# Tapti Projects Estimates

OVERALL ESTIMATE FOR PRELIMINARY SURVEYS AND INVESTIGATIONS IN CONNECTION WITH PROJECTS FOR THE MULTI-PURPOSE DEVELOPMENT OF THE TAPTI BASIN.

I. WORKS—  1. Dams and Appurtenant works—			A08	strace	•					
	-									Rs.
A. Preliminary expenses .				•						5,80,000
K. Buildings						_				60,000
2. Main canals and Branches .		·			_	·				14,78,800
3. Discharge and Silt Observations		•	•	•	•	•	•	•	•	1,40,000
4. Meteorological Observations	•	•	•	•	•	•	•	•		17,200
5. Mineral surveys ,	•	•	•	•	•	•	•	•	• •	
	•	•	•	•	•	•	•	•		5,000
6. Surveys for Pisciculture .	•	•	•	•	•	•	•	•		1,000
7. Malaria surveys	•	•	•	•	•	•	•	•		2,500
8. Electric Load surveys .	•	•	•	•	•	•	•	•		5,000
9. Surveys for Navigation .	•	•	•	•	•	•	•	•		40,000
<ol><li>Economic and property surveys</li></ol>	5.	•	٠.	•	•	•	•	•		20,000
11. Surveys for soil erosion .	•		•	•	•					5,000
12. Communications	•		•	•			•	•		1,50,000
13. Special Tools and Plant .	•	•		•		•				2,30,000
									•	05.04.500
										27,34,500
2 per cent. contingencies .	•	•	•	•	•	•	•	•		54,690
						Total	Work	g _		27,89,190
							,, 0	~ •	• •	
I. TOOLS AND PLANT—										
Tools and plant for the Divisions										2,19,000
2 per cent. contingencies .	•	•	Ĭ.	•		_	•			4,380
- ber earte courseBerrere	•	•	•	•	•	•	•	•	•	
				$T_0$	tal To	ols an	d Plai	ıt.		2,23,380
I. WORKS—		_	etail <b>s</b>							
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing	by	air pl	hotogr	aphy	and	groun	l surv	rey al	nd plotting	3
Dams and Appurtenant Works— A. Preliminary Expenses—	s by ls on	air pl	hotogr	aphy =1 r	and nile	groun	d surv		nd plotting	y.
Dams and Appurtenant Works— A. Preliminary Expenses— 1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval	s by ls on	air pl	hotogr	aphy =1 r	and nile	ground	d surv		ą. miles.	3
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing	by ls on	air pl	hotogr	aphy =1 r	and nile	ground	d surv			3
Dams and Appurtenant Works— A. Preliminary Expenses— 1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam	s by ls on	air pl	hotogr	ephy =1r	and nile	ground	d surv		q. miles. 275	ž
Dams and Appurtenant Works— A. Preliminary Expenses— 1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam	s by ls on	air pl	hotogr	aphy	and nile	ground	d surv		q. miles. 275 34	ğ
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam	s by ls on	air pl	hotogr	aphy =1r	and nile	ground	I surv		q. miles. 275 34 18·6	g
Dams and Appurtenant Works— A. Preliminary Expenses— 1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam	s by ls on	air pl	hotogr	aphy =1r	and nile	ground	e surv		q. miles. 275 34	<b>3</b>
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam	s by ls on	air pl	hotogr	aphy =1r	and nile	•	I surv		q. miles. 275 34 18·6	- -
Dams and Appurtenant Works— A. Preliminary Expenses— 1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam	ls on	air pl	hotogr	aphy = 1 r	and nile	•	•		q. miles. 275 34 18·6 15	-
Dams and Appurtenant Works— A. Preliminary Expenses— 1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam  342.6 Sq. Miles @ Rs. 375 p.	ls on	air plascal	hotograe of 4'	'=1 r	nile		· · · · · · · · · · · · · · · · · · ·		q. miles. 275 34 18·6 15	; - - Rs. 1,28,00
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam	er Sq.	air plascal	hotograe of 4'	y=1 r	nile		· · · · · · · · · · · · · · · · · · ·		q. miles.  275  34  18·6  15  342·6	- - Rs. 1,28,00
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam  342.6 Sq. Miles @ Rs. 375 p.  2. Survey of the dam sites and surveys and plotting on a scale	er Sq.	air plascal	hotograe of 4'	y=1 r	nile		· · · · · · · · · · · · · · · · · · ·		q. miles.  275  34  18.6  15  342.6	- - Rs. 1,28,00
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam  342.6 Sq. Miles @ Rs. 375 p.  2. Survey of the dam sites and surveys and plotting on a scal  (a) Ukai/Tokarwa dam site	er Sq.	air plascal	hotograe of 4'	y=1 r	nile		· · · · · · · · · · · · · · · · · · ·		q. miles.  275  34  18.6  15  342.6	- - Rs. 1,28,00
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam  342.6 Sq. Miles @ Rs. 375 p.  2. Survey of the dam sites and surveys and plotting on a scal  (a) Ukai/Tokarwa dam site (b) Kakarpara weir site	er Sq.	air plascal	hotograe of 4'	y=1 r	nile		· · · · · · · · · · · · · · · · · · ·		a. miles.  275  34  18.6  15  342.6  acres. 3,006 600	-  Rs. 1,28,00
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam  342.6 Sq. Miles @ Rs. 375 p  2. Survey of the dam sites and surveys and plotting on a scal  (a) Ukai/Tokarwa dam site (b) Kakarpara weir site (c) Hatnur weir site	er Sq.	air plascal	hotograe of 4'	y=1 r	nile		· · · · · · · · · · · · · · · · · · ·		q. miles.  275  34  18.6  15  342.6	-  Rs. 1,28,00
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam  342.6 Sq. Miles @ Rs. 375 p.  2. Survey of the dam sites and surveys and plotting on a scal  (a) Ukai/Tokarwa dam site (b) Kakarpara weir site	er Sq.	air plascal	hotograe of 4'	y=1 r	nile		· · · · · · · · · · · · · · · · · · ·		a. miles.  275  34  18.6  15  342.6  acres. 3,006 600	-  Rs. 1,28,00
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam  342.6 Sq. Miles @ Rs. 375 p.  2. Survey of the dam sites and varveys and plotting on a scal  (a) Ukai/Tokarwa dam site (b) Kakarpara weir site (c) Hatnur weir site (d) Nawtha dam site .	er Sq.	air plascal	hotograe of 4'	y=1 r	nile		· · · · · · · · · · · · · · · · · · ·		a. miles.  275  34  18.6  15  342.6  acres. 3,000 600	- Rs. 1,28,00
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam  342.6 Sq. Miles @ Rs. 375 p.  2. Survey of the dam sites and varveys and plotting on a scal  (a) Ukai/Tokarwa dam site (b) Kakarpara weir site (c) Hatnur weir site (d) Nawtha dam site (e) Atawadhna dam site	er Sq.	air plascal	hotograe of 4'	y=1 r	nile		· · · · · · · · · · · · · · · · · · ·		a. miles.  275  34  18.6  15  342.6  acres. 3,000 600 600	- Rs. 1,28,00
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam  342.6 Sq. Miles @ Rs. 375 p.  2. Survey of the dam sites and varveys and plotting on a scal  (a) Ukai/Tokarwa dam site (b) Kakarpara weir site (c) Hatnur weir site (d) Nawtha dam site (e) Atawadhna dam site (f) Panjhra dam site	er Sq.	air plascal	hotograe of 4'	y=1 r	nile		· · · · · · · · · · · · · · · · · · ·		a. miles. 275 34 18.6 15 342.6  acres. 3,000 600 600 600 800	 Rs. 1,28,00
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam  342.6 Sq. Miles @ Rs. 375 p.  2. Survey of the dam sites and varveys and plotting on a scal  (a) Ukai/Tokarwa dam site (b) Kakarpara weir site (c) Hatnur weir site (d) Nawtha dam site (e) Atawadhna dam site	er Sq.	air plascal	hotograe of 4'	y=1 r	nile		· · · · · · · · · · · · · · · · · · ·		a. miles.  275  34  18.6  15  342.6  acres. 3,000  600  600  600  600	 Rs. 1,28,00
Dams and Appurtenant Works—  A. Preliminary Expenses—  1. Survey of the reservoir basing contours at 10 ft.—5 ft. interval  Tokarwa (a) Ukai/dam (b) Nawtha Dam (c) Atawadhna dam (d) Waghar and Panjhra dam  342.6 Sq. Miles @ Rs. 375 p  2. Survey of the dam sites and variety and plotting on a scal  (a) Ukai/Tokarwa dam site (b) Kakarpara weir site (c) Hatnur weir site (d) Nawtha dam site (f) Panjhra dam site (g) Waghur dam site  -(g) Waghur dam site .	er Sq.	air plascal	hotograe of 4'	y=1 r	nile		· · · · · · · · · · · · · · · · · · ·		a. miles. 275 34 18.6 15 342.6  acres. 3,000 600 600 600 800	- Rs. 1,28,0

											Nos.	
(a) Kakarpar Wen				_	_						22	
(b) Ukai/Tokarwa d	am	•		Ċ	•	·	·	•	•		160	
(c) Hatnur we.											20	
(d) Nawtha dam					•			•			27	
(e) Atawadhna dam			•	•	•			•	•	•	27	
(f) Waghur dam	•	•	•	•	•	•	•	•	•	•	40	
(g) Panjhra dam	•	•	•	•	•	•	•	•	•	٠	100	
											400	
400 nos. each of 5 4. Soil analysis and bu 5. Model Experiments	rrow s	survej	s for	earth	en da	ms, 11	ıcludı	-	sting		. L. S. . L. S.	4,00, ₀ 00 10,000 10,000
K. Buildings—												5,80,000
Temporary buildings					•		•				. L.S.	60,000
II. Main canuls and branch (a) Surveys of the com		ed are	as fo	or alıgı	nmeni	t of ca	inals.				Acres.	
Canals ex. Kakarpar	a.	•	•	•	•	•	•	•	•	•	7,00,000	
Canals ex. Hatnur	•	•	•	•	•	•	•	•	•	•	5,00,000	
Canals ex. Waghur a	nd Pa	anjlira	•	•	•	•	٠	•	٠	•	30,6,0	
										-	12,50,000	
12,70,000 a cs at	Rs I	/ ner	acr			_				_		14,06,300
(b) Miscellaneous surv		·		·	٠.	٠.		٠.	. ]	L N.		10,000
(c) Exploration for th	•		n o	f cros	s Lra	ınage	work	s an				•
surveys		•		,			•	- •	•			50,000
(d) Soil surveys 12,50	,,υυυ ε	acres a	it Ks	. 1 pe	r 100	acres		•	•	•	_	12,500
											_	14,78,800
											_	
III. Dischurge and Silt Obse	rvatio	ns (Pe	errod	4 year	rs)							
One boatman and four k	ialasis	at ea	ch d	ıschar	ge sit				lischai	rge		
•	lalasıs ilt saj	at ea mpler	ch d s and	ıschar d labo	ge sit rator	y equ	upme	nt.		•		`
One boatman and four ki	lalasıs ilt saj	at ea mpler	ch d s and	ıschar d labo	ge sit rator	y equ	upme	nt.		•		1,40,000
One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and	ialasis ilt sai 1 2 o	at ea mpleri n Wa	ch d s and aghui	ischar d labo r and	ge sit rator Panj	y equ hra) a	upme at Rs.	nt. . 5,000	o per	site		1,40,000
One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and per year	lialesis ilt san il 2 or	at eamplers n Warrain go	s and aghur	ischar d labo r and s, temp	ge sit prator Panj peratu	re, hu	ipmer at Rs.	nt. 5,000 y and these	o per	site		1,40,000
One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self reco	ild sand 2 or	at ea mplers n Wa rain g	ech d s and aghur augea new ) Hu	ischar d labor and s, temp	ge sit irator Panj peratu gauge y and	y equality server, hu	ipmer at Rs.	nt. 5,000 y and these	o per	site		
One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self rece at five stations, at a	ilt sand 2 or sions, stone or ording	at ea mplers n Wa rain g f ten type rage r	auges new ) Hu	ischar d labor and s, temp rain g imidit of Rs.	ge sit prator Panj peratu gauge y and	y equince, hu	at Rs.	nt. 5,000  y and these	o per	site		1,40,000
One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self reco	ilt sand 2 or sions, stone or ording	at ea mplers n Wa rain g f ten type rage r	auges new ) Hu	ischar d labor and s, temp rain g imidit of Rs.	ge sit prator Panj peratu gauge y and	y equince, hu	at Rs.	nt. 5,000  y and these	o per	site		
One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installating at five stations, at a Recurring expenditure	ilt sand 2 or sions, stone or ording	at ea mplers n Wa rain g f ten type rage r	auges new ) Hu	ischar d labor and s, temp rain g imidit of Rs.	ge sit prator Panj peratu gauge y and	y equince, hu	at Rs.	nt. 5,000  y and these	o per	site	-	10,000
One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installatintegrated self receat five stations, at a Recurring expenditure for 4 years	ilt sand 2 or sions, stone or ording	at ea mplers n Wa rain g f ten type rage r	auges new ) Hu	ischar d labor and s, temp rain g imidit of Rs.	ge sit prator Panj peratu gauge y and	y equince, hu	at Rs.	nt. 5,000  y and these	o per uind to be appar	site  velo- e of catus 5 p.m.	-	10,000 7,200 17,200
One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installating integrated self receat five stations, at a Recurring expenditure for 4 years  V. Mineral Surveys	ilt sand 2 or income, since of the constant of	at ea mplers n We rain go f ten type rage re eart tir	auges new ) Hu	ischar d labor and s, temp rain g imidit of Rs.	ge sit prator Panj peratu gauge y and	y equince, hu	at Rs.	nt. 5,000  y and these	o per uind to be appar	site velo- e of ratus 5 p.m.	-	10,000 7,200 17,200 5,000
One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installating integrated self receat five stations, at a Recurring expenditure for 4 years	ilt sand 2 or income, since of the constant of	at ea mplers n We rain go f ten type rage re eart tir	auges new ) Hu	ischar d labor and s, temp rain g imidit of Rs.	ge sit prator Panj peratu gauge y and	y equince, hu	at Rs.	nt. 5,000  y and these	o per uind to be appar	site  velo- e of catus 5 p.m.	-	10,000 7,200 17,200 5,000 [1,000
One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self rece at five stations, at a Recurring expenditure for 4 years  V. Mineral Surveys VI. Surveys for Piscici	ilt sand 1 2 on interest in a version son p	at ea mplers n We rain go f ten type rage re eart tir	auges new ) Hu	ischar d labor and s, temp rain g imidit of Rs.	ge sit prator Panj peratu gauge y and	y equince, hu	at Rs.	nt. 5,000  y and these	o per uind to be appar	site velo- e of ratus 5 p.m. L. S. L. S.	-	10,000 7,200 17,200 5,000 [1,000 :,500
One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self rece at five stations, at a Recurring expenditure for 4 years  V. Mineral Surveys VI. Surveys for Piscici VII. Malaria survey	tions, stone of the control of the c	at ea mplers n We rain go f ten type rage re eart tir	auges new ) Hu	ischar d labor and s, temp rain g imidit of Rs.	ge sit prator Panj peratu gauge y and	y equince, hu	at Rs.	nt. 5,000  y and these	o per cuind to be appar	velo- e of ratus 5 p.m. L. S. L. S. L. S.		10,000 7,200 17,200 5,000 [1,000
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One boatman and four ki rods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self rece at five stations, at a Recurring expenditure for 4 years  V. Mineral Surveys VI. Surveys for Piscie VII. Malaria survey VIII. Electrical Load sur IX. Surveys for naviga X. Economic and pro XI. Surveys for soil ere	halasis ilt saj ilt saj ilt saj tions, tions, tion o ording n ave s on p rveys tion perty psion	at ea mpler n Wa rain go f ten type rage r art tir	ach des and saghur auges	ischar d labor and s, temp rain g imidit of Rs.	ge sit prator Panj peratu gauge y and	y equince, hu	at Rs.	nt. 5,000  y and these	o per vind vind vind to be appar	site velo- e of ratus 5 p.m. L. S. L. S. L. S. L. S.		10,000 7,200 17,200 5,000 1,000 2,500 5,000 40,000
One boatman and four kirods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self record at five stations, at a Recurring expenditure for 4 years  V. Mineral Surveys  VI. Surveys for Pisciel VII. Malaria survey  VIII. Electrical Load surveys in Surveys for naviga X. Economic and propicts in Surveys for soil erox XII. Communications—	ilt saj ilt sa	s at ea mplers n Wa rain go f ten type rage ri art tin	ach de aghur	rain gimidit f Rs.	ge sit rator la Panj l	y equ hra) : we, hu s (som i wind 10 ob	upme.  .  .  .  .  .  .  .  .  .  .  .  .	y and these coity	on per vind vind vind vind vind vind vind vind	site velo- e of ratus 5 p.m. L. S. L. S. L. S. L. S. L. S.		10,000 7,200 17,200 5,000 [1,000 -,500 5,000 40,000 20,000
One boatman and four kirods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self records at five stations, at a Recurring expenditure for 4 years  V. Mineral Surveys  VI. Surveys for Pisciel VII. Malaria survey  VIII. Electrical Load surix. Surveys for naviga X. Economic and proposition of the surveys for soil erox XII. Communications—  Constructing 50 miles 3,000 per mile	halasis ilt say ilt sa	at ea mplering rain go f ten type rage ri art tin	ach de aghur	rain gimidit f Rs.	ge sit rator la Panj l	y equ hra) : we, hu s (som i wind 10 ob	upme.  .  .  .  .  .  .  .  .  .  .  .  .	y and these coity	on per vind vind vind vind vind vind vind vind	site velo- e of ratus 5 p.m. L. S. L. S. L. S. L. S. L. S.		10,000 7,200 17,200 5,000 [1,000 -,500 5,000 40,000 20,000
One boatman and four kirods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self records at five stations, at a Recurring expenditure for 4 years  V. Mineral Surveys  VI. Surveys for Piscient VII. Malaria survey  VIII. Electrical Load survix. Surveys for navigation and properties at the surveys for soil error XII. Communications—  Constructing 50 miles 3,000 per mile  XIII. Special Tools and I a Diamond drills communication and I a Diamond drills communicating apparatus and I are the side of the surveys are the surveys for soil error in the surveys for soil	ilt said litt sa	rain go f ten type rage ri art tin  mpora- with a and w	ach de sandaghur auger new ) Huate o me ol	rain gumidit f Rs. bserva	ge sit rator	y equina) :  ore, hu s (som i wine i) oob	upme.  midit ne of divelo	nt 5,000  y and  these poity  rs at	o per vind vind vind vind vind vind vind vind	site velo- e of ratus 5 p.m. L. S. L. S. L. S. L. S. L. S.		10,000 7,200 17,200 5,000 1,000 2,500 40,000 20,000 5,000
One boatman and four kirods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self records at five stations, at a Recurring expenditure for 4 years  V. Mineral Surveys  VI. Surveys for Piscion VII. Electrical Load surix. Surveys for naviga X. Economic and project XII. Surveys for soil ex XII. Communications— Constructing 50 miles 3,000 per mile  XIII. Special Tools and Face of the state	halasis ilt sai ilt sa	rain go f ten type rage ri art tin  mpora- with a and w	ach de sandaghur auger new ) Huate o me ol	rain gumidit f Rs. bserva	ge sit rator	y equina) :  ore, hu s (som i wine i) oob	upme.  midit ne of divelo	nt 5,000  y and  these poity  rs at	o per vind vind vind vind vind vind vind vind	site velo- e of ratus 5 p.m. L. S. L. S. L. S. L. S. L. S.		10,000 7,200 17,200 5,000 [1,000 2,500 40,000 20,000 5,000
One boatman and four kirods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self records at five stations, at a Recurring expenditure for 4 years  V. Mineral Surveys  VI. Surveys for Piscient VII. Malaria survey  VIII. Electrical Load surveys in Surveys for navigation in the surveys for soil error in the surveys for soil	halasis ilt sai ilt sa	rain go f ten type rage ri art tin  mpora- with a and w	ach de sandaghur auger new ) Huate o me ol	rain gimidit f Rs. bserva	ge sit rator	y equina) :  ore, hu s (som i wine i) oob	upme.  midit ne of divelo	nt 5,000  y and  these poity  rs at	o per vind vind vind vind vind vind vind vind	site velo- e of ratus 5 p.m. L. S.		10,000 7,200 17,200 5,000 [1,000 2,500 40,000 20,000 1,50,000 1,80,000
One boatman and four kirods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self records at five stations, at a Recurring expenditure for 4 years  V. Mineral Surveys  VI. Surveys for Piscient VII. Malaria survey  VIII. Electrical Load surveys in Surveys for navigation in the surveys for soil error in the surveys for soil	halasis ilt sai ilt sa	rain go f ten type rage ri art tin  mpora- with a and w	ach de sandaghur auger new ) Huate o me ol	rain gimidit f Rs. bserva	ge sit rator	y equina) :  ore, hu s (som i wine i) oob	upme.  midit ne of divelo	nt 5,000  y and  these poity  rs at	o per vind vind vind vind vind vind vind vind	site velo- e of ratus 5 p.m. L. S.		10,000 7,200 17,200 5,000 1,000 2,500 40,000 20,000 1,50,000 1,80,000 50,000 2,30,000
One boatman and four kirods, floats, gauges, s 7 sites (5 on Tapti and per year  IV. Meteorological Observations—  Equipment and installa integrated self records at five stations, at a Recurring expenditure for 4 years  V. Mineral Surveys  VI. Surveys for Piscient VII. Malaria survey  VIII. Electrical Load surveys in Surveys for navigation in the surveys for soil error in the surveys for soil	halasis ilt sai ilt sa	rain go f ten type rage ri art tin  survey  with a and w	ach de sandaghur auger new ) Huate o me ol	rain gimidit of Rs. bserva	ge sit rator la Panj peratu gauge y and 1,000 tions	y equina) :  ore, hu s (som i wine i) oob	midit and of divelopment in a continum in a	y and these coity ars at the second these coity are at the second the secon	o per uind to be appar Rs. 14	site velo- e of ratus 5 p.m. L. S.		10,000 7,200 17,200 5,000 [1,000 2,500 40,000 20,000 1,50,000 1,80,000

		王书								
II. TOOLS AND PLANT—										D _a
. 1. Motor vehicles for survey parties 7 vehi	1010~	at D	7 000	٠.٠٠						Rs.
Working expenses for 4 years.	rutea.	at rus,	7,000	9 tG	•	•	•	•		49,000
2 Scientific Instruments	•	•	•	•	•	•	•	•	•	70,000
3. Ordinary Tools and Plant	•	•	•	•	•	•	•	•	•	60,000
. ~	•	•	•	•	•	•	•	•	•	5,000
r 000 0 11	•	•	•	•	•	•	•	•	•	15,000
5. Office furniture	•	•	•	•	•	•	•	•	• -	20,000
9										2,19,000
2 per cent. contingencies	•	•	•	•	•	•	•	•	•	4,380
Total Tools and Plant		•	•							2 23,380
III, ESTABLISHMENT—									-	
									R	xpenditure pei year
1. Pay of officers—										-
Executive Engineer 1 No. at Rs. 875 p.m.		•				•				10,500
Asstt. Executive Engineer 2 Nos. at Rs. 6	00 p	.m								14,400
Asstt. Engineers 2 Nos. at Rs. 560 p.m.									•	13,140
Geologist 1 No. at Rs. 875 pm.					٠.	٠ عم				10,500
Asstt. Geologist 2 Nos. at Rs. 500 p.m.										12,000
Drill Foreman 1 No. at Rs. 1,000 pm.										12,000
										72,840
2. Pay of establishment —										
1 Meteorological Assistant at Rs. 240 p.:	m.		4		•				•	2,880
Accountant at Rs 200 p.n.	•		•		•	•	•	•	•	2,400
1 Hoad Clerk at Rs. 180 p.m.	•		•	•	•	•	•	•	•	2,160
3 Senior Clerks at Rs. 150 p.m	•	•	•	•	•	•	•	•	•	5,400
1 Storekeeper at Rs. 150 p.m.	•	•	•	•		•	•	•	•	1,800
1 Senior Di ftsman at Rs. 200 p.m	•	•	•	•	•	•		•	•	2,400
7 Junior Clerks at Rs. 93 p.m.	•	•	•		•	•	•	•	•	7,812
1 Junior Draftsman at Rs. 143 p.m	•	•	•	•	•	•	•	•	•	1,716
2 Tracers at Rs. 104 p.m	٠	•	•	•	•	•	•	•	•	2,496
1 Sub Asstt. Surgeon at Rs. 170 p.m.	•	•	•	٠	•	•	•	•	•	2,040
1 Compounder at Rs 50 p.m.	•	•	•	•	•	•	•	•	•	600
16 Overseers at Rs. 240 p.m	٠	•	•	•	•	•	•	•	•	46,080
3 Research Assistants at Rs. 240 p.m.	•	•	•	•	•	•	•	•	•	8,640
1 Laboratory Assistant at Rs. 230 p.m		•	•	•	•	•	•	•	•	2,760
I Silt Analyst at Rs. 200 p.m	•	•	•	•	•	•	•	•	•	2,400
1 Asstt. Silt Analyst at Rs. 93 p.m.	•	•	•	•	•	•	•	•	•	1,116
5 Gauge Readers at Rs. 70 p.m	. •	•	•	•	•	٠	•	•	•	4,200
5 Senior Observers at Rs. 90 p.m.	•	•	•	•	•	•	•	•	٠	5,400
1 Dafadars at Rs. 33 p.m	•	•	•	•	•	•	•	•	•	396
5 Barkandaz at Rs. 33 p.m.	•	•		•	•	•	•	•	•	1,980
Peons at Rs. 33 p.m	•	•	•	•	•	•	•	•		2,772
3 Laboratory khalasis, at Rs. 33.p.m		•	•	•	•	٠	•			1,188
5 Chowkidars at Rs. 33 1 m.	•	•	•	•	•	•	•	٠	•	1,980
									_	
										1,10,616
3. Dearness allowance for officers				•					•	9,720
4. Dearness allowance of establishment .			٠							32,940
5. Travelling allowance for officers										20,000
6. Travelling allowance for establishment.										13,000
7. Cost of Project Circle office debited to Tapt	i.						•			17,000
8. Establishment contingencies										10,000
Of THROUGHTHERE CONTAINED	•	-							-	
Establishment per year .		_	_	_	_		_	_		3 02 114
ratabusument per year .	•	•	•	•	•	•	•	•	•	3,03,116
Total establish	nmer	t for f	our w	38.79	_	_	_			12,12,464
Total establish	mmati	0 10L I	our ye	COLID	•	•	•	•	•	404,41,404

II. ESTIMATE FOR PRELIMINARY SURVEYS AND INVESTIGATIONS IN CONNECTION WITH PROJECTS FOR MULTIPURPOSE DEVELOPMENT IN THE BASIN OF TAPTI RIVER FOR THE YEAR 1947-48 SUBMITTED TO GOVERNMENT FOR SANCTION.

NMENT FOR SANCTION.		47 - 1							D-
I. WORKS		Abst.	ract •		•	•			Rs. 61,960
II. TOOL AND PLANT	•	•	•	:	:	:			1,56,684 41,895
I. WORKS							Grant	t total	2,66,540
1. Dams and appurtenant works—								Rs.	
(i) Survey to be carried out by the Su						. I	. 8.	2,500	
(ii) Survey to be carried out by or un	der the	e direc	tion	s of	$_{ m the}$	~	ď	10.000	
C. W. I. N. C.	•	•	•	•	•		. S.	19,000	
<ol> <li>Main canals and Branches —Soil sur Discharge and silt Observations .</li> </ol>	-	•	•	•	•	. 1	J. S.	12,640	
	• 1 ~~~~~	•	•	•	•	•	•	4,570	
Geological investigations and mineral  Communications		ys	•	•	•	•	•	1,000 10,000	
6. Special Tools and Plant (Drill	• equi	ipmen	· t e	nd	appara		for	,	
soil laboratory)	•	•	•	•	•	. 1	4. S.	11,000	
7. Contingencies 2 per cent	•	•	•	•	•	•	•	1,250	
			T	otal	works	٠	•	61,960	
II. TOOL AND PLANT— 6 weapon carriers at Rs. 7,000 each							****	42,000	
2 jeeps with trailers at Rs. 7,000 each	•	•	•	•	•	•	•		
2 country boats at Rs. 1,000 each.	•	•	•	•	•	•	•	14,000 2,000	
3 outboard motors at Rs. 1,000 each	•	•	•	•	•	•	•	3,000	
6 chronographs at Rs. 100 each .	•	•	•	•	•	•	•	600	
8 levelling instruments at Rs. 800 each	•	•	•	•	•	•	•	6,400	
1 theodolite at Rs. 1,500	•	•	•	•	•	•	•	1,500	
1 Binocular at Rs. 200 each	•	•	•	•	•	•	•	200	
8 measuring chains at Rs. 15 each .			•	•	•	·	•	120	
30-100 ft. tapes at Rs. 30 each .					•	•		900	
30-50 ft. tapes at Rs. 20 each .					•			600	
3 steel tapes at Rs. 100 each							•	300	
5 Drawing boards at Rs. 30 each .					•		•	150	
5 second class drawing instruments box	es at 1	Rs. 20	)Ο eε	ach.			•	1,000	
2 First class drawing instruments boxe	s at R	s. 300	eac	h				600	
Scales with offsets, French curves and	miscell	laneou	s sci	ienti	fic instr	umer	ts and	l	
tools and plant		•						800	
8 current meters at Rs. 1,000 each .	•	•			•		•	8,000	
6 large boats for discharge observations	s at Re	s. 1,00	90 ев	ich.	•	•		6,000	
6 small boats at Rs. 500 each	•	•	•	•	•		•	3,000	
Discharge rods	•	•	•	•	•	•	•	800	
Ropes	•	•	•	•	•	•	•	4,000	
1 set of laboratory apparatus for silt of	bserva	tions a	at R	s. 1,	500 eacl	<b>.</b>	•	1,500	
Recurring laboratory equipment .	•	•	•	•	•	•	•		200
14 by 14 tents 5 Nos. at Rs. 1,200 each		•	•	•	•	•	•	6,000	
10 by 10 tents 15 Nos. at Rs. 800 each	•	•	•	•	•	•	•	12,000	
15 shouldaries at Rs. 600 each	•	•	•	•	•	•	•	9,000	
15 servants, tents at Rs. 600 each .	•	•	•	•	•	•	•	9,000	
Camp funriture L. S	roimi	.00	•	•	•	•	•	4,000	
Office furniture for Divisional and Sub Office furniture for soil physicist's office					•	•	•	9,000	
Office furniture for geologist's office.	e and	TRIDOLE	reor	•	•	•	•	3,000	
office furnitude for geologist a diffee.	•	•	•	•	•	•		2,996	
					Total	٠.	•	1,52,436	200
(b) Repairs and Carriage—Repairs to	Trucks		•	•	•	•	•		1,000
(c) Contingencies 2 per cent	•	•	٠	•	•	•	•	3,049	
			Cota		ols and I			1,55,485 1,56,685	1,200
III, ESTAHLISHMENT—					-				<del>^</del>
(a) Pay of officers—									
1 Executive Engineer for 3 months at	Rs. 90	0 p.m						2,700	
2 Assistant Engineers at Rs. 350 p.m.								2,100	
1 Geologist for 3 months at Rs. 600 p.	m					•	•	1,800	
1 Soil Physicist for 4 months at Rs. 27			•					1,100	*
•					То	tal	•	7,700	
	٠								

ray of establishment.—								
5 Overseers for 3 months @ 180. p.m.			_					2,700
1 Head clerk for 3 months @ 160-p.m.	•	•		•	•	•	•	480
1 Accountant for 3 months @ 200-p.m.			Ċ	·	Ċ	•	Ž	600
1 Sub Assistant Surgeon for 1 month @ 2	200- p	.m.						200
2 Clerks for 3 months @ 80- p.m	•							480
4 Sub Divl. clerks for 3 months @ 75-p.r	-							900
1 Junior Draftsman for 3 months @ 100-								300
2 Tracers for 3 months @ 80- p.m.	•							480
1 Dispenser for 1 month @ 80- p.m.								80
1 Daffadar for 1 month @ 35-p.m.								35
2 Barkandaz for 1 month @ 30 -p.m.		•		•				60
4 Peons for 3 months @ 30-p.m.	•	•						360 `
2 Peons for 3 months for officers @ 30-p	m.							180
2 Dak runn rs for 3 months @ 30- p.m.		•						180
5 Khalasis for 3 months for overseers @	30/- F	.m.						450
3 Gauge readers for 3 months @ 30- p.m.		•	•	•		•		270
Geologists' staff L.S								600
6 Sub overseers for 4 months @ 50-p.m	•			•	•			1,200
3 Laboratory Assistants for 4 months @	100-	p.m.	•		•			1,200
2 Clerks for 4 months @ 40- p.m. each								320
1 Computor for 4 months @ 40- p.m. eac	eh	•	•	•			٠	160
1 Tracer for 4 months @ 40- p.m. each	•					•		160
3 Laboratory peons for 4 months @ 25-	p.m.	each	•				•	300
2 Peons for 4 months @ 25- p.m.		•	•			•		200
1 Tapali for 4 months @ 25- p.m.	•	•	•	•	•			100
4 Auger measurers for 4 months @ 40- p	p.m. e	ach	•	•	•	•	•	640
Total			•	•	•			12, 630
D	. 046-	T	CT.					1.007
Dearness allowances and Special Pay of		ers L.	.o.	•	•	•	•	1,965
Dearness allowance of establishment L.	ю.	•	•	•	•	•	•	8,000
Travelling allowance of officers	:	:	•	:	:	:	:	800
2 Assistant Engineers								800
1 Geologist		•						1,800
1 Soil Physicist	•							1,750
I Note I my Madana .	•	•	•	•	•	•	•	_ g
							•	5,150
Travelling allowance of establishment :								
Supervisors								1,200
Other staff (Executive Engineer)								1,200
	•	•	•	•	•	•	•	1 600
	•	•		•	:	•	:	1,600
Geologist — Other staff	•	•	•	•	•	•		200
Geologist — Other staff	•	•	•		•	•	•	200 600
Geologist — Other staff Sub-overseers Auger measures	•	•	•		•	•	•	200 600 600
Geologist — Other staff	•	•		•		•	•	200 600 600 500
Geologist — Other staff Sub-overseers Auger measures	•					•	•	200 600 600
Geologist — Other staff Sub-overseers Auger measures Other Staff	•		•				•	200 600 600 500
Geologist — Other staff . Sub-overseers Auger measures Other Staff	loffic							200 600 600 500 4,700
Geologist — Other staff  "Sub-overseers  Auger measures  Other Staff  (b) Establishment Contingencies.—  Rent for Divisional and Sub Divisional								200 600 600 500
Geologist — Other staff . Sub-overseers Auger measures Other Staff								200 600 600 500 4,700
Geologist — Other staff  "Sub-overseers  Auger measures  Other Staff  (b) Establishment Contingencies.—  Rent for Divisional and Sub Divisional Rent for Soil Physicist's office and laborated								200 600 600 500 4,700 1,000 500 250
Geologist — Other staff  "Sub-overseers  Auger measures  Other Staff  (b) Establishment Contingencies.—  Rent for Divisional and Sub Divisional Rent for Soil Physicist's office and laborated								200 600 600 500 4,700

G. N. PANDIT,
Project Officer, (Narbada and Tupti).

III ESTIMATE FOR THE PRELIMINARY SURVEY AND INVESTIGATIONS WITH THE PROJECTS FOR MULTIPURPOSE DEVELOPMENT IN THE BASIN OF THE TAPTI RIVER FOR THE YEAR 1948-49, SUBMITTED TO GOVERNMENT FOR SANCTION

NMENT FOR SANCTION				
I. WORKS	t		Rs:	
II. TOOLS AND PLANT	• •	•	16,76,000 1,00,000	
III. ESTABLISHMENT		•	2,80,000	
	• •	•		
Grand Total I. WORKS—	•	•	20,56,000	
1. Dams and Appurtenant Works — A. Preliminary Survey to be carried out by the survey of India Do		i.3.		2,00,000
Surveys to be carried out by one survey of india be		ve t		20,000
K. Buildings L.S.				25,000
2. Main canal and Branches.— Misc. surveys as canal alignments, Special reservoir	* CHTTT/OTTC	· ·	•	25,000
Soil surveys L.S	1 Surveys	000	• •	45,000
3. Discharge and Silt Observations L.S.		•	• •	50,000
4. Meteorological surveys.—		•	•	-0,000
(a) Rain gauges—It is proposed to instal 30 new installation of gauges 30 new rain gauges included the said wind velocity apparatus at 15 places are guages at an average rate of 500/- each.	ling tem	peratu	re, humi-	15,000
(ii) Observation expenditure per year	• •	•	• •	10,000
1 Meteorological Assistant at 200/- p.m.			2,400	
1 Senior observer at 120/- p.m			1,440	•
30 Part time observers at Rs. 15-p.m. each		•	5,400	
30 Part time retainers at Rs. 12- p.m			4,320	13,560
(b) Seismological surveys L.S	, .			28,560 10,000
				38,560
Say		•	• •	38,000
5. Geological Investigations and mineral surveys	etc. L.S.	•	• •	10,000
6. Communications L.S	• .			25,000
7. Special Tools and Plant (Drill equipment and a ry) L.S	pparatus	for so	il laborato-	12,00,000
8. Economic surveys L.S.		•		3,000
9. Hydro-Electric Installlations.—A. Preliminary	expenses	 3	•	0,000
•		-		
Electric Load surveys L.S	•			2,000 33,000
Contingencies at 2 per cent	• .	: :	: :	33,000
Contingencies at 2 per cent Total Works	•	•	: :	
Contingencies at 2 per cent  Total Works  II.TOOLS AND PLANT—	•	• •	2000	33,000
Contingencies at 2 per cent  Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each		•	3,000	33,000
Contingencies at 2 per cent  Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each  6 Chronogarphs at Rs 100- each		•	600	33,000
Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each  6 Chronogarphs at Rs 100- each  4 Levelling instruments at Rs 800- each			600 <b>3,20</b> 0	33,000
Total Works  Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each  6 Chronogarphs at Rs 100- each  4 Levelling instruments at Rs 800- each  2 Theodolites at Rs. 1500- each			600 3,200 3,000	33,000
Total Works  Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each  6 Chronogarphs at Rs 100- each  4 Levelling instruments at Rs 800- each  2 Theodolites at Rs. 1500- each  2 Binoculars at Rs. 200- each			600 3,200 3,000 400	33,000
Total Works  Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each.  6 Chronogarphs at Rs 1000- each.  4 Levelling instruments at Rs 800- each  2 Theodolites at Rs. 1500- each  2 Binoculars at Rs. 200- each  1 Camera at Rs. 600			600 3,200 3,000 400 600	33,000
Total Works  Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each.  6 Chronogarphs at Rs 1000- each.  4 Levelling instruments at Rs 800- each  2 Theodolites at Rs. 1500- each  2 Binoculars at Rs. 200- each  1 Camera at Rs 600  4 Measuring chains at Rs. 15- each			600 3,200 3,000 400 600	33,000
Total Works  Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 4 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each. 1 Camera at Rs 600 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 30- each.			600 3,200 3,000 400 600	33,000
Total Works  Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 2 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each 1 Camera at Rs. 200- each 1 Camera at Rs. 600- 4 Measuring chains at Rs. 15- each 10—100 ft. tapes at Rs. 30- each 10—50 ft. tapes at Rs. 20- each			600 3,200 3,000 400 600 60	33,000
Total Works  Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 4 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each. 1 Camera at Rs 600 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 30- each.			600 3,200 3,000 400 600 60 300 200	33,000
Total Works  Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 2 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each. 1 Camera at Rs. 600 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 20- each.			600 3,200 3,000 400 600 60 300 200	33,000
Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 2 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each 1 Camera at Rs. 200- each 1 Camera at Rs. 200- each 1 Camera at Rs. 200- each 2 Measuring chains at Rs. 15- each 10—100 ft. tapes at Rs. 30- each 2 Steel tapes at Rs. 100- each Scales with offsets, french curves and Misc. Scientific instruments, tools and plant 4 current meter at Rs. 1000- each			600 3,200 3,000 400 600 60 300 200 200	33,000
Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 2 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 1 Camera at Rs. 200- each 1 Camera at Rs. 200- each 1 Camera at Rs. 200- each 2 Measuring chains at Rs. 15- each 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 100- each Scales with offsets, french curves and Misc. Scientific instruments, tools and plant.			600 3,200 3,000 400 600 60 300 200 200	33,000
Total Works  II. TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 4 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each 1 Camera at Rs 600 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 100- each. Scales with offsets, french curves and Misc. Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 Large boats at Rs. 1000- each. 6 Small boats at Rs. 500- each.			600 3,200 3,000 400 600 60 300 200 200 200	33,000
Total Works  Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 1000- each. 4 Levelling instruments at Rs 8000- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 2000- each. 1 Camera at Rs. 6000- 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 300- each. 2 Steel tapes at Rs. 200- each. 2 Steel tapes at Rs. 1000- each. Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 Large boats at Rs. 1000- each.			600 3,200 3,000 400 600 60 300 200 200 200 4,000 6,000	33,000
Total Works  II. TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 4 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each 1 Camera at Rs 600 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 100- each. Scales with offsets, french curves and Misc. Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 Large boats at Rs. 1000- each. 6 Small boats at Rs. 500- each.			600 3,200 3,000 400 600 60 300 200 200 4,000 6,000 3,000 200 200	33,000
Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 2 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each. 1 Camera at Rs. 600 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 20- each. 2 Steel tapes at Rs. 100- each. Scales with offsets, french curves and Misc. Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 Large boats at Rs. 1000- each. 6 Small boats at Rs. 500- each. Discharge rods Recurring laboratory equipment. Ropes			600 3,200 3,000 400 600 60 300 200 200 4,000 6,000 3,000 200 200 1,500	33,000
Total Works  II. TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 2 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each 1 Camera at Rs. 600 4 Measuring chains at Rs. 15- each 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 20- each. 2 Steel tapes at Rs. 100- each. Scales with offsets, french curves and Misc. Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 Large boats at Rs. 1000- each. 6 Small boats at Rs. 500- each. Discharge rods Recurring laboratory equipment. Ropes 7 Nos. 14×14' tents at Rs. 1200- each.			600 3,200 3,000 400 600 60 300 200 200 4,000 6,000 3,000 200 200 1,500 8,400	33,000
Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 1000- each. 4 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each. 1 Camera at Rs. 600- 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 20- each. 2 Steel tapes at Rs. 100- each. Scales with offsets, french curves and Misc. Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 Image boats at Rs. 1000- each. 6 Small boats at Rs. 500- each. Discharge rods Recurring laboratory equipment. Ropes 7 Nos. 14×14' tents at Rs. 1200- each. 20 Nos. 10'×10' tents at Rs. 800- each. 20 Shouldaries at Rs. 600- each.			600 3,200 3,000 400 600 60 300 200 200 4,000 6,000 3,000 200 200 1,500 8,400 16,000	33,000
Total Works  II. TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 1000- each. 4 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each 1 Camera at Rs 600- 4 Measuring chains at Rs. 15- each 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 20- each. 2 Steel tapes at Rs. 100- each. 5 Scales with offsets, french curves and Misc. 8 Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 I arge boats at Rs. 1000- each. 6 Small boats at Rs. 500- each. Discharge rods Recurring laboratory equipment. Ropes 7 Nos. 14×14' tents at Rs. 1200- each. 20 Nos. 10'×10' tents at Rs. 800- each. 20 Servants tents at Rs. 600- each.			600 3,200 3,000 400 600 60 300 200 200 4,000 6,000 3,000 200 200 1,500 8,400 16,000 12,000	33,000
Total Works  II. TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 2 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each. 1 Camera at Rs. 600- 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 20- each. 2 Steel tapes at Rs. 100- each. Scales with offsets, french curves and Misc. Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 Large boats at Rs. 1000- each. 6 Small boats at Rs. 500- each. Discharge rods Recurring laboratory equipment. Ropes 7 Nos. 14×14' tents at Rs. 1200- each. 20 Nos. 10'×10' tents at Rs. 800- each. 20 Servants tents at Rs. 600- each. Camp farmiture			600 3,200 3,000 400 600 60 300 200 200 4,000 6,000 3,000 200 1,500 8,400 16,000 12,000 12,000 12,000	33,000
Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 4 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each. 1 Camera at Rs. 600- 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 20- each. 2 Steel tapes at Rs. 100- each. Scales with offsets, french curves and Misc. Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 Small boats at Rs. 1000- each. 6 Small boats at Rs. 500- each. Discharge rods Recurring laboratory equipment. Ropes 7 Nos. 14×14' tents at Rs. 1200- each. 20 Nos. 10'×10' tents at Rs. 800- each. 20 Shouldaries at Rs. 600- each. 20 Servants tents at Rs. 600- each. Chang famiture Office furniture for Divl. and Sub. Divl. offices Office furniture for Soil Physicist office and Lab.			600 3,200 3,000 400 600 60 300 200 200 4,000 6,000 3,000 200 200 1,500 8,400 16,000 12,000	33,000
Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 1000- each. 4 Levelling instruments at Rs 800- each 2 Theodolites at Rs, 1500- each. 2 Binoculars at Rs, 200- each. 1 Camera at Rs 600- 4 Measuring chains at Rs, 15- each. 10—100 ft. tapes at Rs, 30- each. 10—50 ft. tapes at Rs, 20- each. 2 Steel tapes at Rs, 100- each. Scales with offsets, french curves and Misc. Scientific instruments, tools and plant. 4 current meter at Rs, 1000- each. 6 Large boats at Rs, 1000- each. 6 Small boats at Rs, 500- each. Discharge rods Recurring laboratory equipment. Ropes 7 Nos. 14×14' tents at Rs, 1200- each. 20 Nos. 10'×10' tents at Rs, 800- each. 20 Servants tents at Rs, 600- each. Camp familiume Office furniture for Divl. and Sub. Divl. offices Office furniture for geologist office and Lab.			600 3,200 3,000 400 600 60 300 200 200 4,000 6,000 3,000 200 1,500 8,400 12,000 12,000 3,000 2,000 2,000 2,000	33,000
Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 100- each. 4 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each. 1 Camera at Rs. 600- 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 20- each. 2 Steel tapes at Rs. 100- each. Scales with offsets, french curves and Misc. Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 Small boats at Rs. 1000- each. 6 Small boats at Rs. 500- each. Discharge rods Recurring laboratory equipment. Ropes 7 Nos. 14×14' tents at Rs. 1200- each. 20 Nos. 10'×10' tents at Rs. 800- each. 20 Shouldaries at Rs. 600- each. 20 Servants tents at Rs. 600- each. Chang famiture Office furniture for Divl. and Sub. Divl. offices Office furniture for Soil Physicist office and Lab.			600 3,200 3,000 400 600 60 300 200 200 4,000 6,000 3,000 12,000 12,000 12,000 12,000 2,000	33,000
Total Works  II.TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 1000- each. 2 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each. 1 Camera at Rs. 600- 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 20- each. 2 Steel tapes at Rs. 100- each. Scales with offsets, french curves and Misc. Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 Large boats at Rs. 1000- each. 6 Small boats at Rs. 500- each. Discharge rods Recurring laboratory equipment. Ropes 7 Nos. 14×14' tents at Rs. 1200- each. 20 Nos. 10'×10' tents at Rs. 800- each. 20 Shouldaries at Rs. 600- each. 20 Servants tents at Rs. 600- each.			600 3,200 3,000 400 600 60 300 200 200 4,000 6,000 3,000 200 1,500 8,400 16,000 12,000 12,000 12,000 2,000 2,000 2,000 2,000 2,000	33,000
Total Works  II. TOOLS AND PLANT—  3 country boats at Rs 1000- each. 6 Chronogarphs at Rs 1000- each. 4 Levelling instruments at Rs 800- each 2 Theodolites at Rs. 1500- each. 2 Binoculars at Rs. 200- each. 1 Camera at Rs. 600- 4 Measuring chains at Rs. 15- each. 10—100 ft. tapes at Rs. 30- each. 2 Steel tapes at Rs. 20- each. 2 Steel tapes at Rs. 100- each. Scales with offsets, french curves and Misc. Scientific instruments, tools and plant. 4 current meter at Rs. 1000- each. 6 Large boats at Rs. 1000- each. 6 3mall boats at Rs. 500- each. Discharge rods Recurring laboratory equipment. Ropes 7 Nos. 14×14' tents at Rs. 1200- each. 20 Nos. 10'×10' tents at Rs. 800- each. 20 Servants tents at Rs. 600- each. Chain familiure Office furniture for Divl. and Sub. Divl. offices Office furniture for soil Physicist office and Lab. Office furniture for geologist office (b) Repairs and Carriage-Yearly repairs to trucks			600 3,200 3,000 400 600 60 300 200 200 4,000 6,000 3,000 12,000 12,000 12,000 12,000 2,000 2,000 3,500	33,000

## III. ESTABLISHMENT.—

III. ESTABLISHMENT.—	
Pay of Officers.—	
1 Executive Engineer for 12 months @ Rs. 900 p.m	10,800
4 Assistant Engineers for 12 months @ Rs. 350 p.m	16,800
I Geologist for 12 months @ Rs. 600 p.m	7,200
2 Asstt. Goologists for 12 months @ Rs. 400 p.m	9,600
1 Soil Physicist at Rs. 275 p-m	3,300
•	47,700
Pay of establishment.—	41,100
16 Overseers for 12 months @ Rs. 180 p.m	34,560
1 Head clerk for 12 months at Rs. 160 p.m	1,920 ~
1 Accountant for 12 months at Rs. 200 p.m	2,400
1 Sub Asstt. Surgeon for 12 months at Rs. 200 p.m	2,400
5 Clerks for 12 months at Rs. 80 p.m	4,800
8 Sub Divl. clerks for 12 months at Rs. 75 p.m	7,200
l Head Draftsman for $12$ months @ Rs. $250$ p.m	3,000
1 Junior Draftsman for 12 months @ Rs. 100 p.m	1,200
2 tracers for 12 months @ Rs. 80 p.m	1,920
l Dispenser for 12 months @ Rs. 80 p.m	960
1 Daffadar for 12 months @ Rs. 35 p.m	420
5 Barkandaz for 12 months @ Rs. 30 p.m	1,800
11 Peons for 12 months @ Rs. 30 p.m	3,960
6 Peons for 12 months for officers @ Rs. 30 p.m.	2,160
5 Chowkidars for 12 months @ Rs. 30 p.m	1,800
6 Dak runners for 12 months @ Ŕs. 30 p.m	2,160
16 Khalasis for overseers for 12 months @ Rs. 30 p.m	5,760
10 Gauge readers for 12 months @ Rs. 30 p.m	3,600
Geologists staff L.S	7,400
6 Sub Overseers for 12 months at Rs. 50 p.m.	3,600
3 Laboratory Asstts for 12 months @ Rs 100 p.m	3,600
2 Clerks for 12 months @ Rs. 40 p.m.	960
1 Computor for 12 months @ Rs. 40 p.m	480
1 Tracer for 12 months @ Rs. 40 p.m.	480
3 Laboratory peons for 12 months @ Rs. 25 p.m	900
2 Peons for 12 months @ Rs. 25 p.m	600
1 Tapali for 12 months @ Rs. 25 p.m	300
4 Auger measurers for 12 months @ Rs. 40 p.m	1,920
(Tata)	1,02,260
Total	12,235
Dearness allowance of establishment	49,000
Travelling Allowance of officers.—	20,000
	1
	,
Soil Physicist	
Travelling allowance of establishment.—	
Supervisors 14,800	1
Other staff XEN'S 6,400	
Geologist other staff	
Soil survey staff.—	
Sub overseers	
Auger measurers	)
Other staff	29,455
Establishment contingencies.—	
Rent for Divl. and Sub Divl. offices	4,000
. Rent for soil physicist office and laboratory	. 1,500
Rent for geologist office	3,000
	8,500
m 1 178 (-110 mont)	
Total Establishment	. 2,80,000

G. N. PANDIT, Project Officer, (Narbada & Tapti). IV Estimate for Preliminary Surevys and Investigations in connection with Projects for the multi-purpose developments of the Tapti Basin, Prepared in Accordance with the Instructions of the *ad hoc* Committee.

## Abstract.

I. WORKS—											Rs.
1. Dams and appurtenant Works—											
A. Preliminary Expenses .	•	•	•	•	•	•	•		•	•	3, 19,525
K. Buildings	•	•	•	•	•	•	•	•	•	•	40,000
2. Main Canals and Branches .	•	•	•	•	•	•	•	•	•	•	4,36,750
3. Discharge and Silt observations	•	•	•	•	•	•	•	•	•	•	70,000
4. Meteorological observations	•	•	•	•	•	•	•	•	•	•	13,600
5. Mineral surveys	•	•	•	•	•	•	•	•	•	•	5,000
6. Surveys for Pisciculture .	•	•	•	•	•	•	•	•	•	•	1,000
7. Malaria survey	•	•	•	•	•	•	•	•	•	•	2,500
8. Electric Load Surveys	•	•	•	•	•	•	•	•	•	•	4,000
9. Surveys for Navigation .	•	•	•	•	•	•	•	•	•	•	40,000
10. Economic and Property surveys 11. Surveys for soil erosion .	•	•	•	•	•	•	•	•	•	•	15,000 <b>4,</b> 000
12. Communications	•	•	•	•	•	•	•	•	•	•	90,000
13. Special Tools and Plant .	•	•	•	•	•	•	•	•	•	•	1,70,000
13. Special 10018 and Flame .	•	•	•	•	•	•	•	•	•	٠.	1,10,000
					_						12,11,375
					3 pe	r cent	. cont	ingen	eies	• _	24,227
						•					12,35,602
II. TOOLS AND PLANT					•						1,87,680
III. ESTABLISHMENT			•			•					5,72,232
•						Gr	and T	otal			19,95,514
								Or Sa	у.	. ~	19,95,500
		DET	AIL	S					•	-	
								,			
I. WORKS—						•					
1. Dams and appurtenant works-											
<ol> <li>Dams and appurtenant works—</li> <li>A. Preliminary Expenses—</li> <li>Survey of the Reservoir Basin contours at 10 ft.—5 ft. interval Dam at Rs. 375 per sq. mile</li> </ol>	ls on	a sca	le of	4=1 n	aile 27	75 sq.	miles •	of Uk	ai/To	karwa	Rs.
<ol> <li>Dams and appurtenant works—</li> <li>A. Preliminary Expenses—</li> <li>Survey of the Reservoir Basin contours at 10 ft.—5 ft. interval</li> </ol>	ls on	a sca	le of	4=1 n	aile 27	75 sq.	miles •	of Uk y and	ai/To	karwa	
<ol> <li>Dams and appurtenant works—         A. Preliminary Expenses—     </li> <li>Survey of the Reservoir Basin contours at 10 ft.— 5 ft. interval Dam at Rs. 375 per sq. mile</li> <li>Survey of dam and weir site is on a scale of 32" =1 mile—</li> </ol>	ls on	a sca	le of	4=1 n	aile 27	75 sq.	surve	y and	ai/To	karwa	
<ol> <li>Dams and appurtenant works—         A. Preliminary Expenses—     </li> <li>Survey of the Reservoir Basin contours at 10 ft.—5 ft. interval Dam at Rs. 375 per sq. mile</li> <li>Survey of dam and weir site I on a scale of 32°=1 mile—         Ukai/Tokarwa dam site         Kakarpar weir site     </li> </ol>	ls on	a sca	le of	4=1 n	aile 27	75 sq.	surve	y and	ai/To	karwa	1,03,125
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1. Dams and appurtenant works— A. Preliminary Expenses—  1. Survey of the Reservoir Basin contours at 10 ft.—5 ft. interval Dam at Rs. 375 per sq. mile  2. Survey of dam and weir site to a scale of 32° =1 mile—  Ukai/Tokarwa dam site Kakarpar weir site  3,600 acres at Rs. 4 per acre  3. Geological investigations for for basin by boring, core drilling, m  Kakarpar weir Ukai/Tokarwa dam  182 Nos. each of 50 R ft.—9,100 I  4. Soil Analysis and burrow surve  5. Model experiments by the India	ds on by a unda akir R ft. bys i	ir pho  ir pho  ations ig drif	togra	phy and tunn coer R setting	and gro	ound	surve Acre 3,00 60 3,60 . te and noludi Nos 22 160	of Uk y and os. 00 00 of the	ai/To	otting  L. S. L. S.	1,03,125  . 14,400  1,82,000 10,000 10,000 3,19,525
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1. Dams and appurtenant works— A. Preliminary Expenses—  1. Survey of the Reservoir Basin contours at 10 ft.—5 ft. interval Dam at Rs. 375 per sq. mile 2. Survey of dam and weir site I on a scale of 32° =1 mile—  Ukai/Tokarwa dam site Kakarpar weir site  3,600 acres at Rs. 4 per acre 3. Geological investigations for for basin by boring, core drilling, m  Kakarpar weir Ukai/Tokarwa dam 182 Nos. each of 50 R ft.—9,100 I 4. Soil Analysis and burrow surve 5. Model experiments by the Indi  K. Buildings—Temporary Buildings  II. Main Canals and Branches—  (a) Surveys of the commanded area	s on .  .  .  .  .  .  .  .  .  .  .  .  .	at Rancludi Waterv	of danders	m site d tunn  coer R : sting Station	and grown and welling	ound  veir si etc. i	Acres 3,00 60 3,60 te and noludi Nos. 22 160	of Uk y and of the	ai/To	ctting  L. S. L. S.	1,03,125  . 14,400  1,82,000 10,000 10,000 3,19,525 40,000 3,93,750
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1. Dams and appurtenant works— A. Preliminary Expenses—  1. Survey of the Reservoir Basin contours at 10 ft.—5 ft. interval Dam at Rs. 375 per sq. mile  2. Survey of dam and weir site is on a scale of 32°=1 mile—  Ukai/Tokarwa dam site Kakarpar weir site  3,600 acres at Rs. 4 per acre  3. Geological_investigations for for basin by boring, core drilling, m  Kakarpar weir  Ukai/Tokarwa dam  182 Nos. each of 50 R ft.—9,100 I  4. Soil Analysis and burrow surve 5. Model experiments by the Indi  K. Buildings—Temporary Buildings  II. Main Canals and Branches—  (a) Surveys of the commanded area (b) Miscellaneous surveys (c) Exploration for the foundations (d) Soil surveys 7,00,000 acres at Re  III. Discharge and Silt observations—  Period 2 years  One boatman and four khalasis a floate, gauges, silt samplers and year  IV. Meteorological observations—  Rain gauges, temperature, humidit Equipment and installation of ten self-recording type) and humic	by a by a lab	at Rancludi Water  canal ross di per 10  ach di orator	togra togra of dan ts and ts and ts and alignman alignman schar y equ nd ve	ment 7 ge wordes ge situition ge situition ge situition ge situition ge situition ge situition	and welling  ft.  7,00,00  ks and  e, cost  t 7 sit	veir si etc. i	miles . surve Acre 3,00 60 3,60 . te and noludi Noss 22 160	of Uk y and ss. 00 00 of the ng tes	ai/To	cods, e per	1,03,125  . 14,400  1,82,000 10,000 10,000 3,19,525 40,000 30,000 7,000 4,36,750
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1. Dams and appurtenant works— A. Preliminary Expenses—  1. Survey of the Reservoir Basin contours at 10 ft.—5 ft. interval Dam at Rs. 375 per sq. mile  2. Survey of dam and weir site is on a scale of 32°=1 mile—  Ukai/Tokarwa dam site Kakarpar weir site  3,600 acres at Rs. 4 per acre  3. Geological_investigations for for basin by boring, core drilling, m  Kakarpar weir  Ukai/Tokarwa dam  182 Nos. each of 50 R ft.—9,100 I  4. Soil Analysis and burrow surve 5. Model experiments by the Indi  K. Buildings—Temporary Buildings  II. Main Canals and Branches—  (a) Surveys of the commanded area (b) Miscellaneous surveys (c) Exploration for the foundations (d) Soil surveys 7,00,000 acres at Re  III. Discharge and Silt observations—  Period 2 years  One boatman and four khalasis a floate, gauges, silt samplers and year  IV. Meteorological observations—  Rain gauges, temperature, humidit Equipment and installation of ten self-recording type) and humic	oy a	ations ations at Rancludi Water to the canal ross dranch di orator and wir and	of dand of the total of the tot	m site of tunn  oer R: sting Station  ge wor es  ge site ipmen	and welling  ft.  7,00,00  ks and  c, cost  t 7 sit	75 sq	Acre 3,00 60 3,60 . te and neludii Nos 22 160 coessar;	of Uk y and ss. 00 00 . of the ng tes y sur discha	ai/To	cods, e per	1,03,125  . 14,400  1,82,000 10,000 10,000 3,19,525 40,000 30,000 7,000  4,36,750 .  70,000

V. Min													<b></b>
	eral surveys .		•			•						. L. Ś	Rs. 5,000
VI. SU	rveys for Pisciculture		•	•	•			•	•	•	•	. L. S	. 1,000
VII. M	alaria survey	•	•			•	•	•		•	•	. L. S	. 2,500
ATIT: F	Electric load survey	•	•	•		•	•	•	•	•	•	. L. S	4,000
	rvey for Navigation	•		•	•	•	•	•		•		. L. S	40,000
	onomic and Property s	ırveys			•		•			•	•	. L. S	15,000
	rveys for soil erosion	•	•	•	•	•						. L. S	4,000
	ommunications												
	nstructing 30 miles of per mile	•	rary 1	oads.	and t	heir i	maint •	enand	e for	2 year	rs at	Rs. 3,00	90 <b>,000</b>
	Special Tools and Plan												
1.	2 Diamond Drills com	plete 7	vith a	ccess	ories a	t Rs.	60,0	00 eac	h.	•	•	•	1,20,000
4.	Testing apparatus and of rocks and testing so	ila for	ratory	and	work	shop	equir	ment	for	ompre	ssive	strengt	h
•	etc		•	. 2016	menn,	opur	•			OH POH P	*.	. L.S	
													1,70,000
													12,11,375
z I	per cent. contingencies	•	•	•	•	•	•	•	•	•	•	•	. 24,227
													12,35,602
II mo	OT 0 4370 mm 4300						•						12,00,002
	OLS AND PLANT—												
	Motor vehicles for sur			vehi	cles a	t Rs.	7,000	each	•	•	•	•	. 49,000
	Working expenses for		3	•	•	•	•	•	•	•	•	•	. 35,000
	Scientific Instruments		•	•	•	•	•	•	•	•	•	•	60,000
	Ordinary tools and pla	int	•	•	•	•	•	•	•	•	•	•	5,000
	Camp equipage .	•	•	•	•	•	•	•	•	•	•	•	. 15,000
5.	Office furniture .	•	•	•	•	•	•	•	•	•	•	•	. 20,000
													1,84,000
9	2 per cent. contingenci	es	_			_							. 3,680
			•	•	•	•	•	·	•	•	•	•	. 0,000
							Tota	al tool	s and	plant	•	•	. 1,87,680
III. ES	TABLISHMENT—												Expenditure
													per year.
1.	Pay of officers—												
	Executive Engineer				•	•	•	•	•	•	•	•	. 10,500
	Asstt. Executive Engi			s. 600	p.m.		•	•	•	•	•	•	. 14,400
	Asstt. Engineers at I		p.m.		•	•	•	•	•	•	•	• ,	. 13,440
	Geologist at Rs. 875		•	•	•	•	•	•	•	•	•	•	. 10,500
	Asstt. Geologists at I				•	•	•	•	•	•	•	•	. 12,000
1.	Drill Foreman at Rs	. 1,000		•	•	•	•	•	•	•	•	•	. 12,000
													72,840
2.	Pay of Establishment	_											
1.	Meteorological Asstt.	at Rs	. 240	p.m.									. 2,880
1.	Accountant at Bs. 20	00 p.m	١٠	•									. 2,400
1.	Head Clerk at Rs. 18	30 p.m								•			. 2,160
3.	Senior Clerks at Rs.	150 p.:	m.			•							. 5,400
1.	Storekeeper at Rs. 14	50 p.m											. 1,800
1.	Senior Draftsman at	Rs. 20	00 p.m	L•									. 2,400
7.	Junior Clerks at Rs.	93 p.n	1.										. 7,812
~,	Junior Draftsmen at	Rs. 14	43 p.n	1.									. 1,716
ı.			•										2,496
		200.•	•	•					_				. 2,040
2.	Tracers at Rs. 104 p.		Լ70 թ.։	m.									
2. 1.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a	t Rs. 1		m.		•	•	•	•	•	•		
2. 1. 1.	Tracers at Rs. 104 p.	t Rs. 1 60 p.m.		m. •	•	•	•	•	•	•	•	•	. 600
2. 1. 1. 16.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 5 Overseers at Rs. 240	t Rs. 1 60 p.m. p.m.	•	•	•	•	•	•	•	•	•	•	. 600 . 46,080
2. 1. 1. 16. 3.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 5 Overseers at Rs. 240 Research Asstts. at I	t Rs. 1 60 p.m. p.m. 3s. 240	p.m.	•	•	•	•	•	•	•	•	•	. 600 . 46,080 . 8,640
2. 1. 1. 16. 3.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 5 Overseers at Rs. 240 Research Asstts. at I Laboratory Asstt. at	t Rs. 1 60 p·m. p·m. Rs. 240 6 Rs. 2	p.m.	•	•	•	•	•	•	•		•	. 600 . 46,080 . 8,640 . 2,760
2. 1. 1. 16. 3. 1.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 5 Overseers at Rs. 240 Research Asstts. at I Laboratory Asstt. at Silt Analyst at Rs. 2	t Rs. 1 60 p·m. p·m. Rs. 240 Rs. 2	) p.m. 30	•		•	•	•	•	•			. 600 . 46,080 . 8,640 . 2,760 . 2,400
2. 1. 16. 3. 1. 1.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 5 Overseers at Rs. 240 Research Asstts. at I Laboratory Asstt. at Silt Analyst at Rs. 2 Asstt. Silt Analyst a	t Rs. 1 60 p·m. p.m. Rs. 240 6 Rs. 2 600 t Rs. 9	) p.m. 30	•	•	•	•	•	•	•	•	•	. 600 . 46,080 . 8,640 . 2,760 . 2,400
2. 1. 16. 3. 1. 1.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 5 Overseers at Rs. 240 Research Asstts. at I Laboratory Asstt. at Silt Analyst at Rs. 2 Asstt. Silt Analyst a Gauge Readers at R	t Rs. 1 60 p·m. p.m. Rs. 240 6 Rs. 2 600 t Rs. 9	) p.m. 30	•	•	•	•	•	•	•	•	•	. 600 . 46,080 . 8,640 . 2,760 . 2,400 . 1,116
2. 1. 16. 3. 1. 1. 5.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 5 Overseers at Rs. 240 Research Asstts. at I Laboratory Asstt. at Silt Analyst at Rs. 2 Asstt. Silt Analyst a Gauge Readers at R Senior observers at I	t Rs. 1 60 p·m. p.m. Rs. 240 6 Rs. 2 600 t Rs. 9	) p.m. 30	•	•	•	•		•	•			. 600 . 46,080 . 8,640 . 2,760 . 2,400 . 1,116 . 4,200
2. 1. 16. 3. 1. 1. 5.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 240 Research Asstts. at I. Laboratory Asstt. at Silt Analyst at Rs. 2 Asstt. Silt Analyst at Rs. 2 Gauge Readers at R. Senior observers at I. Dafadars at Rs. 33	t Rs. 1 60 p-m. p-m. Rs. 240 6 Rs. 2 600 t Rs. 9 8. 70 Rs. 90	) p.m. 30	•	•	•	•		•				. 600 . 46,080 . 8,640 . 2,760 . 2,400 . 1,116 . 4,200 . 5,400
2. 1. 16. 3. 1. 1. 5.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 240 Research Asstts. at I. Laboratory Asstt. at Silt Analyst at Rs. 2 Asstt. Silt Analyst at Rs. 2 Gauge Readers at R Senior observers at I. Dafadars at Rs. 33 Barkandaz at Rs. 33	t Rs. 1 60 p-m. p-m. Rs. 240 6 Rs. 2 600 t Rs. 9 8. 70 Rs. 90	) p.m. 30	•	•		•	•	•				. 600 . 46,080 . 8,640 . 2,760 . 2,400 . 1,116 . 4,200 . 5,400 . 396 . 1,980
2. 1, 16. 3. 1. 1. 5. 5.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 240 Research Asstts. at I Laboratory Asstt. at Silt Analyst at Rs. 2 Asstt. Silt Analyst at Rs. 2 Gauge Readers at R Senior observers at I Dafadars at Rs. 33 Barkandaz at Rs. 33 Peons at Rs. 33	t Rs. 160 p.m. Rs. 240 Rs. 2 Rs. 2 Rs. 2 Rs. 9 Rs. 90	) p.m. 30	•		•			•				. 600 . 46,080 . 8,640 . 2,760 . 2,400 . 1,116 . 4,200 . 5,400 . 396 . 1,980 . 2,772
2. 1, 16. 3. 1. 1. 5. 5. 7.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 240 Research Asstts. at I Laboratory Asstt. at Silt Analyst at Rs. 2 Asstt. Silt Analyst a Gauge Readers at R Senior observers at I Dafadars at Rs. 33 Barkandaz at Rs. 33 Peons at Rs. 33 Laboratory Khalasis	t Rs. 1 60 p·m. Rs. 240 6 Rs. 2 600 t Rs. 9 8s. 70 Rs. 90	) p.m. 30	•			•		•				. 600 . 46,080 . 8,640 . 2,760 . 2,400 . 1,116 . 4,200 . 5,400 . 396 . 1,980 . 2,772 . 1,188
2. 1, 16. 3. 1. 1. 5. 5. 7.	Tracers at Rs. 104 p. Sub Asstt. Surgeon a Compounder at Rs. 240 Research Asstts. at I Laboratory Asstt. at Silt Analyst at Rs. 2 Asstt. Silt Analyst at Rs. 2 Gauge Readers at R Senior observers at I Dafadars at Rs. 33 Barkandaz at Rs. 33 Peons at Rs. 33	t Rs. 1 60 p·m. Rs. 240 6 Rs. 2 600 t Rs. 9 8s. 70 Rs. 90	) p.m. 30	•		•	•		•				. 600 . 46,080 . 8,640 . 2,760 . 2,400 . 1,116 . 4,200 . 5,400 . 396 . 1,980 . 2,772

											Rs.
3.	Dearness allowance for officers .		•			•					19,720
4.	Dearness allowance for establishment		•								32,940
5.	Travelling allowance for officers .		•								20,000
6.	Travelling allowance for establishment										13,000
7.	Cost of Project Circle office debitable	to Ta	ptı					•	•	•	17,000
8.	Establishment contingencies			•			•	•	•	•	10,000
	Establishment per year		•		•		•	•		• -	2,86,116
	Total Establishment for 2 years .		•	•			•	•			5,72,232

G N. Pandit I roject Officer, (Narbuda & Tapti)

### APPENDIX VI.

# Sabarmati Project

#### Report

### (I) The Sabarmati River.

The Sabarmati river drains a catchment area of 1,723 square miles before entering the Dharoi Gorge. The catchment area above Ahmedabad is about 5,000 square miles. The maximum discharge of the river at Dharoi is about 3,00,000 cusecs, while at Ahmedabad it may be taken to be about 5,00,000 cusecs.

Two important tributaries, the Hathmati (Hill Catchment about 237 square miles) and the Khari (Hill catchment about 100 square miles) meet the Sabarmati between Dharoi and Ahmedabad. Below Ahmedabad, the main stream of the Meshwa System consisting of Meshwa (Hill Catchment about 316 square miles), Migham (Hill Catchment about 157 square miles) and Vatrak (Hill Catchment about 450 square miles) joins the river.

The river is a source of considerable danger to the industrial town of Ahmedabad and villages lower down. Monsoon floods in the past have caused devastation, destroyed crops, carried away cattle, change I course of delta channels and filled up harbours with silt.

#### (II) Works and proposals in the past.

In the past some very small dams and anicuts for storage and irrigation have been constructed on the tributaries of the river. No large works have been undertaken although proposals to harness the main channel of the Sabarmati river have been under contemplation as far back as the second half of the nineteenth century. A scheme was drawn up in 1904 by Bombay Engineers to construct a dam at Dharoi and three pick up weirs at different places down the river up to Ahmedabad. The scheme was, however, dropped as it was not considered at the time sufficiently remunerative. Nothing tangible was done till 1935, when the Baroda Engineers started investigations and by 1942 produced a scheme, the details of which are available in two Volumes. As the project could not proceed without the agreement of the several States having riparian rights and other interests in the waters of Sabarmati, the Baroda State referred it to the Bombay Government, who in turn sought the opinion of the Government of India. In addition, the Baroda Government wanted their project to be 'vetted' by the Central Waterways, Irrigation and Navigation Commission, and for that purpose a party of Engineers of the CWINC, headed by the Member for Irrigation, visited the area by air and land routes, and discussed the scheme with various interests informally and in conferences. All interests showed keenness to participate in a unified multipurpose development of the Sabarmati basin and not in piecemeal schemes and also wanted that the preparation of such a project be undertaken by the CWINC and that a special Division be opened under it for this purpose.

#### (III) Proposals.

To implement the decisions arrived at in the conferences referred to in paragraph II, available data has been studied and proposals are drawn up for opening a Division to complete investigations for drawing up a scheme for unified multipurpose development of the entire Sabarmati basin.

A statement showing the rough details of the dam sites and possible irrigation areas is enclosed. The main work lies on the Sabarmati river itself, as there are possibilities for a dam at Dharoi, where the main stream debouches in the plains. The storage capacity of the reservoir formed by a dam of about 150 feet height at this site may be as much as 30,000 m.c. ft, which is expected in normal years to equal almost all the run off from the catel ment up to this point. The regulated discharge will be of the order of 500 cusecs yielding about 3,000 to 4,000 K.W. of firm power, ensuring about 100 cusecs of constant flow for Ahmedabad water supply and making possible irrigation to the extent of about 1,00,000 acres with or without the help of pick up weirs between Dharoi and Ahmedabad. Detailed investigations are necessary to find the exact location of the sites for pick up weirs, the alignments for canals and location of the areas to be irrigated.

From a st dy of the form line sheets, possible sites for a dam on the Hathmati, a dam on Ghuvai, a pick up weir on the Hathmati for the above two dams, a dam and pick up weir on Meshwa, a dam on Vatrak and a dam on Majham (the main tributaries of the Sabarmati system) have been located very approximately and marked on the index map. The discharge available due to storage at these dams is likely to irrigate another 1,00,000 acres making a total of 2,00,000 acres irrigation over the entire basin

Taking an intensity of 40%, the culturable commanded area should be about 5,00,000 acres. Possible location of the areas making up this figure are shown on the enclosed index map.

#### Estimate.

An estimate is enclosed. Worked out in great detail, it provides for manning a Division with three Sub-Divisions for two years to complete the necessary investigations and to draw up a complete project for the unified multipurpose development of the entire Sabarmati basin.

The estimate amounts to Rs. 15,10,000. Surveys of the reservoir and irrigation areas costing about Rs. 5,86,000 are proposed to be carried out through the Survey of India. All other investigations like the Surveys for dam sites, canal alignment, soil surveys, discharge and silt observations and property surveys are proposed to be carried out independently by the CWINC. Geological surveys including core drilling are proposed to be carried out with the help of resident geologists and under the general advice of the Geological Survey of India. Meteorological Surveys including fixing of new raingauges and observatories for recording temperatures, humidity—wind velocity etc. will be planned and carried out by the CWINC. under the guidance of the Meteorological Department.

Necessary provision has been made in the estimate for temporary buildings to accommodate the staff, for communications, for electric load surveys and for laboratory apparatus etc. Necessary provision has also been made for the purchase of office equipment, scientific and ordinary tools and plant, and motor vehicles for transport in the difficult area.

M. D. MITHAL,

Director, Irrigation and Waterways.

C. W. I. N. C.

STATEMENT SHOWING PROPOSED DAM SITES AND POSSIBLE IRRIGATION AREA ON SABARMATI AND ITS TRIBUTARIES

Name of river or tributary	Site and Location	Dam or pickup wen	Catchment area in sq miles	Possible average annual runoff in million cub ft	Possible annual irrigation in acres	Area to be surveyed in actes for irrigation	Remarks
Sabarmatı	Dharoi . 72°51' E , 24° N.	Dum	1,723	15,000			
	Valasna 72° 47' E. 23° 50' W.	Pickupweir			60,000	150,000	
	Waghpur . 72° 47′ E , 23° 28′ N.	Do.			40,000	100,00 <b>0</b>	
	Ahmedabad. 72° 36' E., 23° 2'N.	Do.					100 cusecs will be reserved for Ahmedabad water supply.
Meshwa	Near Lachhai 73° 10' E., 23° 30' N.	Dam			20.000	<b>#</b> 0.000	
Meshwa .	Near Warwara 73° 5′ E , 23° 30′ N.	Pickup weir	316	2,800	28,000	70,000	
Hathmatı	Near Fatepur 73° 10′ E, 23° 40′ N.	Dam .	237	2,000	20,000	50,000	
Ghuvaı .	Near Khandial 73° 5′ E , 23° 40′ N.	Dam .	)				
Hathmatı	Near H ₁ mmat Nagar. 72° 58' E, 23° 36' N.	Pickup weir	} 192 }	1,600	1,6000	40,000	
Vatrak .	Near Bham- pura. 73° 22' E, 23° 20'N	Dam	450	3,900	39,000	97,000	
Majham .	Near Munsi- wara. 73° 22′ E., 23° 17′ N.	Dam •	157	1,300	13,000	34,000	
		Total	3,075	26,600	216,000	541,000 acres say 850 sq. miles.	

N B—Above the Dharol dam site, there appear to be some sites for dams as indicated on the plan. These will need to be verified for the sake of negotiations amongst the various interests. The ultimate aim is, however, to concentrate on the Dharol dam Site.

# OVERALL ESTIMATE FOR PRELIMINARY SURVEYS AND INVESTIGATIONS FOR POSSIBLE MULTIPURPOSE DEVELOPMENT OF SABARMATI BASIN

#### Abstract

Serial No.	Item								Estimated amount
 1.	Survey through the Survey of India Staff unde	r the	directi	on of	the C	wr	M. C		Rs. 5,86,500
2.	Other river and land surveys to be carried out						11. 0.	•	48,500
3.	Soil Surveys	by th			0		•	•	17,000
4.	Temporary Buildings	•	•	•	•	•	•		10,000
5.	Discharge and Silt Observations	•	•	•		•		•	69,310
6.	Meteorological surveys	•	•	·	•	•		•	2,000
7.	Geological investigations and mineral surveys	•	•	•	•	•			1,87,960
8.	Communications	•	•	•		·		·	15,000
9.	Special T. & P. for laboratory apparatus for Sc	il Sm	vev	•	Ċ				11,000
10.	Electric load and property surveys					-			15,000
11.	Working of motor vehicles	•	•.						30,000
12.	Establishment							·	2,84,880
13.	Tools and plant			•		•			1,63,083
14.	Contigencies and Sundries				•				69,767
					G.	and T	otal		15,10,000

(Sd) M. D. MITHAL,
Director Irrigation and Waterways

# · Details

erial	No. Item	Estimated cost	Total
	0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Rs.	Rs.
1.	Survey through the Survey of India staff.  (a) Survey of reservoir areas scale 4" = 1 mile  100 sq. mile s @ Rs. 320/- per sq. mile	32,000	••
	(b) Contoured survey of Irrigation area scale 4" = 1 mile. 850 sq. miles @Rs. 650/- per sq. mile.	5,52,500	
	(c) Rapid 2" scale map of Dharoi Dam site .	2,000	5,86,50
2.	Other river and land surveys to be carreid out by C.W.I.N.C. staff.		
	(a) Survey of dam site areas (scale 1/1000) contour interval 5' to 10', 10 sq. miles @ Rs. 2,600 per sq. mile.	26,000	
	(b) Longitudinal section of the river and its tri- butaries with cross sections (500 miles @ Rs. 25 per mile).	, 12,500	
	(c) Mapping shoals, sand bars, deep Channels and installing guages.	5,000	
	<ul> <li>(d) Miscellaneous surveys such as canal alignment, special reservoir surveys etc.</li> </ul>	5,000	48,500
3.	Soil surveys.  Work Charged establishment for one year.		
	4 Auger Mukadams @ Rs. 55 p.m. for one year = 2,640. 16 Khallasies @ Rs. 45 p.m. for one year = 8,640.		
	T. A. for work charged establishment . = 720.		
	= 12,000	12,000	
	Testing Water and soil samples, for one year .	5,000	17,00
4.	Temporary Buildings	10,000	10,00
5.	Discharge and silt observations		
	Non recurring expenditure per site on Sabarmati  Current meter ½ per site =	5 <b>0</b> 0	
	Boat large =	800	
	Discharge rods =	100	
	Ropes	300 100	
	Williams where	I,800 	
	For 4 sites non-recurring expenditure :=	7,200	
	tobserver @ Rs. 150/-p.m. including dearness allowance		
	and special pay for $l_2$ years =	= 1,800	
	One boatman @ Rs. 60 p. m. for 1½ years =	1,080	
	4 khallasies @ Rs. 55 p. m. for 1½ years =	3,960 6,840	
	Recurring expenditure for 4 sites = 4×6840 =	27,360.	
	Non recurring expenditure per site on a tributary of Sabarmati—	•	
	current meter =	250	
	Boat small	400	
	Discharge rods and sounding rods =  Ropes	100 100	
		850	
	Non recurring expenditure for 6 sites = 6 × 850 =	5,100.	
_	Recurring expenditure (for 2 years) per site on a tributary of Sabarmati.		

No.	Item.		Estimated cost	Total
	One boatman @ Rs. 55 p. m. for 1 year =	660		
	2 khallasies also suitable as boatsmen @ Rs. 50 p. m. for 1 year	1,200		
		3,660		
/1	Recurring expenditure for 6 sites on tributaries of Sabarmati = 6 × 3,660 =	21,960	61,620	
Œ	b) Silt observations— Equipment	4,000		
•	Laboratory Assistant @ Rs 150 p. m. for 1½ years . =	2,700		
	1 Khallasi @ Rs. 55 p. m. for 11 years =	990		-
	No. of the second Champage	7,690	7,690	69,310
	Meteorological Surveys— Rain guages, temperatures, humidity & wind velocity observations.		2,000	2,000
7.	Geological investigations and mineral Surveys—			
	(a) Equipment (non recurring) 2 diamond drills with equipment @ Rs. 30,000 each	60,000		
	2 diamonds and spares for the above @ Rs. 20,000 each	40,000		
	1 Calyx drill with equipment · · · =	20,000		
	spares for the above =	10,000		
	2 large boats for drills @1,000 each = 2 compressors @ Rs. 5,000 each =	2,000 10.000	1	
		1 (0 000	1 40 000	
	(b) Running expenses for one year  One Drill foreman @ Rs. 1,500 p. m. for one year =	1,42,000 18,000	1 42,000	
,	One Resident Asstt. Geologist @ Rs. 350 p. m. for one year	4,200	•	
	2 Operators @ Rs. 120 p. m =	2,880		
	4 helpers @ Rs. 60 p. m =	2,880		
	· · · ·	2,880 10,000 8,000		
8.	4 helpers @ Rs. 60 p. m =  Dearness allowance & T. A. of staff =	2,880 10,000	<b>45,96</b> 0	187,96
	4 helpers @ Rs. 60 p. m =  Dearness allowance & T. A. of staff =  Running expenses for engines for drills etc. = =	2,880 10,000 8,000	45,960 15,000	
	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000		15,00
8.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000	15,000	15,000 15,000 11,00 '5,00 3 ',00
8. 9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000	15,000 11,000 15,000	15,000 11,00 '5,00
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960	15,000 11,000 15,000	15,000 11,000 '5,000
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960	15,000 11,000 15,000	15,000 11,000 '5,000
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960	15,000 11,000 15,000	15,00 11,00 '5,00
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 = 18,240 = 25,200	15,000 11,000 15,000 30,000	15,00 11,00 '5,00
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 45,960 = 18,240 = 25,200 = 3,300 = 40,320	15,000 11,000 15,000 30,000	15,00 11,00 '5,00
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 45,960 = 18,240 = 25,200 = 3,300 = 40,320 = 4,800	15,000 11,000 15,000 30,000	15,00 11,00 '5,00
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 45,960 = 18,240 = 25,200 = 3,300 = 40,320 = 4,800 = 3,840	15,000 11,000 15,000 30,000	15,000 11,000 '5,000
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 45,960 = 18,240 = 25,200 = 3,300 = 40,320 = 4,800 = 3,840	15,000 11,000 15,000 30,000	15,000 11,000 '5,000
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 45,960 = 18,240 = 25,200 = 3,300 = 40,320 = 4,800 = 3,840 = 9,600	15,000 11,000 15,000 30,000	15,000 11,00 '5,00
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 45,960 = 18,240 = 25,200 = 3,300 = 40,320 = 4,800 = 3,840 4,800 = 9,600 = 5,400	15,000 11,000 15,000 30,000	15,000 11,00 '5,00
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 45,960 = 25,200 = 3,300 = 40,320 = 4,800 = 3,840 = 9,600 = 5,400	15,000 11,000 15,000 30,000	15,000 11,000 '5,000
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 45,960 = 25,200 = 3,300 = 40,320 = 4,800 = 9,600 = 5,400 = 2,400 = 2,400 = 2,400 = 2,400	15,000 11,000 15,000 30,000	15,000 11,00 '5,00
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 45,960 45,960 25,200 25,200 4,800 4,800 9,600 2,400 2,400 2,400 2,400 2,880	15,000 11,000 15,000 30,000	15,000 11,000 '5,000
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 45,960 45,960 25,200 25,200 3,300 40,320 4,800 9,600 2,400 2,400 2,400 2,400 2,400 2,400 2,880 1,440	15,000 11,000 15,000 30,000	15,000 11,00 '5,00
9. 10.	4 helpers @ Rs. 60 p. m	2,880 10,000 8,000 45,960 45,960 45,960 25,200 3,300 40,320 4,800 9,600 2,400 2,400 2,400 2,400 2,400 2,400 2,400 1,440 1,440 1,440	15,000 11,000 15,000 30,000	15,000 11,000 '5,000

No.	ltem ·	Estimated cost	Total	
	4 Daffadars @ Rs. 35 p. m. for 2 years =	3,360	from the objects according to the objects on a first angular converse of	
	5 Barkandazes @ Rs. 30 p. m. for 2 years . =	3,600		
	2 Suboverseers @ Rs. 60 p. m. for 2 years . =	2,880		
	9 Peons (3 for Division, 2 for each sub-division) for 2 years @ Rs. 30 p. m.	6,480		
	2 Peons (1 for Asstt. Geologist, 1 for soil Physicist) for 1 year @ Rs. 30 p. m.	720		
	4 Peons for Officers (one for Ex. Engr. and 1 each for S.D.O.'s) for 2 years @ Rs. 30 p. m. =	2,880		
	6 Chowkidars @ Rs. 30 p. m. for 2 years . =	4,320		
	1 Daftri @ Rs. 35 p. m. for 2 years =	840		
	6 Dak Runners @ Rs. 30 p. m. for 2 years . =	4,320		
	12 Khallasies @ Rs. 30 p. m. for 2 years =	8,640		
	11 Gauge readers @ Rs. 30 p. m. for 2 years . = 1 Laboratory Attendant @Rs. 40 p.m. for 1½ years =	7,920 720		
	2 Clerks for Asstt. Geologist and Soil Physicist for one year @ Rs. 40 p.m. =	960		
	3 Clerks special pay for handling cash for 2			
	years @ $Rs. 20$ p. m =	1,440		
	Geologist staff for one year =	2,000		
	(c) Dearness allowance for officers	1,41,440	1,41,440 8,000	
	(d) Dearness allowance for establishment	•	24,00)	
	(e) Travelling allowance for officers			
	Executive Engineer (2 years) =	7,200		
	Asstt. Engineers (2 years) =	8,600		
	Asstt. Geologist (1 year) ==	1,800		
	Soil Physicist (I year)	1,800		
		19,400	19,400	
	(f) Travelling allowance for establishment—			
	Overseers (2 years)	21,600		
	Other Staff (2 years)	10,000		
	Geologist Staff (1 year)	1,400		
		33,000	33,000	
	(g) Establishment Contingencies—  Rent for divisional and Sub Divisional offices			
	for 2 years	7,000		
	Rent for Soil Physicist office for one year .	1,500		
	Rent for Asstt. Geologist's office for 1 year .	1,500		
	Rent for Laboratory for $1\frac{1}{2}$ years	2,300		
		12,300	12,300	2,84,88
13	Tools and Plant—			
	(a) Scientific instruments and drawing materials—	1		
	5 No. Levelling instruments with stand @ Rs. 700	eacn .	3,500	
	1 No. Theodolite with stand @ Rs. 1,000 each	• •	1,000	
	5 No. Prismatic compasses with stand @ Rs. 160 e	ach	800	
	5 No. Planetables with stand @ Rs. 100 each	• •	500	
	14 No. Levelling staves @ Rs. 40 each	• •	560	
	4 No. Scale boxes complete with scales are offsets (	@ Rs. 15 each	60	
	2 No. Planimeters @ Rs. 200 each	• •	400	
	20 No. Tapes metallic 100 feet @ Rs. 30 each .	• •	600	
	00 3T - 7T 112 - FO 61 - C TD - 407 - 3		400	
	20 No. Tapes metallic 50 ft. @ Rs. 20/ each		200	
	20 No. Tapes metallic 50 ft. @ Rs. 20/-, each 2 No. Instrument drawing boxes 1st size @ Rs. 300	each	600	
			800	
	2 No. Instrument drawing boxes 1st size @ Rs. 300	0 each	4	
	2 No. Instrument drawing boxes 1st size @ Rs. 300 4 No. Instrument drawing boxes 2nd size @ Rs. 200	0 each	800	
	2 No. Instrument drawing boxes 1st size @ Rs. 300 4 No. Instrument drawing boxes 2nd size @ Rs. 200 6 No. Instrument drawing boxes 3rd size @ Rs. 100	0 each	800 600	
	2 No. Instrument drawing boxes 1st size @ Rs. 300 4 No. Instrument drawing boxes 2nd size @ Rs. 200 6 No. Instrument drawing boxes 3rd size @ Rs. 100 2 No. parallel rulers @ Rs. 40 each	0 each	800 600 80 .	
	2 No. Instrument drawing boxes 1st size @ Rs. 300 4 No. Instrument drawing boxes 2nd size @ Rs. 200 6 No. Instrument drawing boxes 3rd size @ Rs. 100 2 No. parallel rulers @ Rs. 40 each	0 each	800 600 80 . 100 210	
	2 No. Instrument drawing boxes 1st size @ Rs. 300 4 No. Instrument drawing boxes 2nd size @ Rs. 200 6 No. Instrument drawing boxes 3rd size @ Rs. 100 2 No. parallel rulers @ Rs. 40 each	O each	800 600 80 . 100	

No.	Item	Estimated cost	Total
	2 No. French curve boxes @ Rs. 30 each	. 60	
	2 No. Straight edges brass @ Rs. 30 each	. 60	
	5 No. Rulers 2 feet fourfold @ Rs. 8 each	. 40	
	1 Slide rule @ Rs. 200 each	. 200	
	5 Colour boxes complete @ Rs. 50 each	. 250	
	12 No. China slops for colours @ Rs. 3 each	. 36	
	9 No Steel tames @ Bg. 100 each	200	
	l No. Apparatus for printing plans	. 300	
	2 No. proportional compasses @ Rs 30 each	. 60	
	2 No. Glasses magnifying @ Rs. 40 each	. 80	
	18 No. Poles surveying @ Rs. 15 each	. 270	
	24 No. Ranging rods @ Rs. 5 each	. 120	
	18 No. Umbrellas field @ Rs. 50 each	. 900	
	12 No. Chronographs @ Rs. 90 each	. 1,080	
	1 Camera @ Rs. 400 each	. 400	
	4 Binoculars @ Rs. 200 each	. 800	
		16,036	16,03
(b)	Plants and Machinery—		
	1 G. M. C. Truck @ Rs. 10,000 each	. 10,000	
	4 Weapon carriers @ Rs. 7,000 each	. 28,000	
	6 Jeeps with trailers @ Rs. 6,000 each	. 36,000	
(a)	Tools—	74,000	74,00
(0)		200	
	6 No. Augers with extension pieces @ Rs. 100 each	. 600	
	6 No. axes carpenters @ Rs. 15 each	. 90	
	12 No. hammers of sizes @ Rs. 5 each	. 60	
	24 No. G. I. Buckets @ Rs. 4 each	. 96	
	24 No. axes country @ Rs. 8 each	. 192	
	12 No. hammers stone breaking @ Rs. 2 each	. 24	
	Pegs iron and nails L. S	. 100	
	24 No. Pick axes @ Rs. 5 each	. 120	
	12 No. Plumbs brass @ Rs. 3 each	. 36	
	6 No. Saws Hand @ Rs. 8 each	. 48	
	l No. stencil plate figures @ Rs. 25 each	. 25	
	I No. stencil plate letters @ Rs. 30 each	. 30	
	24 Nos. Fire buckets @ Rs. 4 each	. 96	
	4 No. Iron safes @ Rs. 400 each	. 1,600	_
(d)	Camp equipment—	3,117	3,1
	12 No. chairs folding with arms @ Rs. 16 each	. 192	
	24 No. tables camp folding @ Rs. 35 each	. 840	
	12 No. Cotton durries @ Rs. 80 each	. 960	
	16 No. Yakdans (record boxes) @ Rs. 40 each	. 640	
	1 No. Swiss cottage double fly tent $14' \times 14'$ @ Rs. 1,200	. 1,200	
	6 No. Swiss cottage double fly tents $12' \times 12'$ @ Rs. 1,000	. 6,000	
	20 No. double fly tents $10' \times 10'$ @ Rs. 700 each		
	20 No. tents double fly $8' \times 8'$ @ Rs. 500 each	. 14,000	
	12 No. servants tents @ Rs. 600 each	. 10,000	
	12 No. shouldaries @ Rs. 600 each	7,200	
	6 No. necessary tents @ Rs. 150 each		
	7 Bath Boards wooden @ Rs. 5 each	900	
	7 Wash hand basins @ Rs. 4 each	. 35	
	7 Jugs @ Rs. 4 each	. 28	
	6 Cots folding @ Rs. 50 each	. 28	
		. 300	
	36 Country charpoys @ Rs. 9 each	. 324	
	4 Lamps petromax @ Rs. 50 each	. 200	
	24 Hurricane lanterns @ Rs. 5 each	. 120	
	7 Buckets G. I. @ Rs. 5 each	. 35	
	A Royal for notromore lantomer @ Do F 1	^-	
	4 Boxes for petromax lanterns @ Rs. 5 each.	50,222	50,22

5. No.	Item	Estimated cost	Total
(e)	Office furniture—		
	7 No. tables for officers @ Rs. 125 each	875	
	20 No. tables with two drawers, handles and locks @ Rs. 60 each	1,200	
	4 No. tables camp folding for clerks @ Rs. 35 each	. 140	
	48 No. Office cane chans @ Rs. 15 each	<b>72</b> 0	
	6 No. easy cane chairs @ Rs. 30 each	180	
	16 No. Cupboards with shelves & Locks @ Rs. 100	1,600	
	26 No. record stands with shelves @ Rs 35 each	910	
	5 Nos. Yakdans or boxes @ Rs. 40 each	200	
	7 No. Benches for peons @ Rs. 25 each	175	
	12 No. Teapoys @ Rs. 15 each	180	
	20 No. Hurricane lanterns @ Rs. 5 each	100	
	4 No. cupboards with six drawers 8" high each, 3' wide 4' long and 5' high for plans @ Rs. 125 each	500	
	12 No. Buckets G. I. @ Rs. 5 each	60	
	14 No. baskets waste paper @ Rs. 3 each	42	
	16 No. call bells @ Rs. 4 each	64	
	12 Nos. stools wooden @ Rs. 6 each	72	
	1 No. Typewriter portable @ Rs. 300	300	
	5 No, typewriters remington rand @ Rs. 450 each	2,250	
	5 Nos. scales with weights 1 to 20 tolas @ Rs. 30 each	150	
	12 Nos. cash and stamps boxes steel @ Rs. 20 each	240	
	5 pigeon holes for despatch clerks @ Rs. 50 each	250	
Missell		200	
	aneous petty items such as pen-knives, scissors, locks, inkstands, ies of peons, etc.	1,500	
		11,708	11,708
(f) I	R. & C. of T. & P.—	8,000	8,000
	ABSTRACT-		
	Scientific instruments and Drawing materials	16,036	
	Plants and Machinery	<b>74,</b> 000	
	Tools	3,117	
	Camp equipage	50,222	
	Office furniture	11,708	
	R. & C. of T. & P	8,000	
	Total .	1,63,083	1,63,083
14	Contingencies and sundries.	69,767	69,767

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Yearly distribution of the amount of the overall estimate for Sabarmati Investigations.

Serial No.	Item	Estimated amount	Probable 1948-49 6 months	expenditure 1949-50	during 1950-51
***************************************		Rs.	Rs.	Rs.	Rs.
1	Surveys through the Survey of India staff under the direction of C. W. I. N. C.	5,86,500	42,000	<b>3,22,</b> 500	2,22,000
2	Other river and land surveys to be carried out by C. W. I. N. C. staff.	48,500	6,000	28,500	14,00
3	Soil Surveys	17,000		17,000	
4	Temporary Buildings	10,000	5,000	5,000	
5	Discharge and Silt Observations	69,310	17,000	34,310	18,000
6	Meteorological Surveys	2,000	1,000	600	400
7	Geological investigations and Mineral		-,		200
	Surveys	1,87,960	25,000	1,62,960	
8	Communications	15,000	10,000	5,000	
9	Special T. & P. for Laboratory Apparatus	,			
	for soil Survey	11,000	<b>11</b> ,000	• •	
10	Electric load and property surveys	15,000		15,000	
11	Working of motor vehicles	30,000	7,500	15,000	7,500
12	Establishment	2,84,880	70,000	1,44,880	70,000
13	T. & P	1,63,083	40,000	1,13,083	10,000.
14	Contingencies and Sundries	69,767	15,500	36,167	18,100
	Total .	15,10,000	2,50,000	9,00,000	3,60,000

(Sd) M. D. MITHAL,
Director, Irrigation and Waterways.

ESTIMATE FOR PRELIMINARY SURVEYS AND INVESTIGATIONS IN CONNECTION WITH PROJECTS FOR MULTIPURPOSE DEVELOPMENT OF THE SABARMATI BASIN PREPARED IN ACCORDANCE WITH THE INSTRUCTIONS OF THE AD-HOC COMMITTEE.

## Abstract

I. WORKS													
1. Dams and A	ppurtenant w	orks											
A preliminary	Expenses							•				•	75,120
K Buildings						•					•	•	10,000
2. Main Canal ar	nd Branches							•					1,44,900
3. Discharge and	l Silt Observa	tions										•	33,400
4. Meteorological	Observations		٠.					•	•	•			2,000
5. Mineral Surve	ув						•						5,000
6. Surveys for Pi	sciculture				•					•		•	1,000
7. Malaria Surve	ys							•					2,000
8. Electrical Loa	d Surveys			•		•						•	10,000
9. Economic and	Property Sur	veys					•						5,000
10. Communicati	ons .									•			10,000
11. Special Tools	and Plant						•		•		•		71,000
													3,69,420
	2% continger	icies				•						•	7,388
		•							<b></b>		١,		0.74.000
II. Tools and Plant									. Tot	al Wo	rks	•	3,76,808
Tools and Plant													1,41,000
	2% contin	genci	<b>es</b>										2,820
													1,43,820
III. Establishment		•					•	•		•			2,66,210
•								G _B	AND '	Totai		•	7,86,838
										8	Say	•	7,87,000

(Sd.) M. D. MITHAL,
Director Irrigation and Waterways

# Details

## I. WORKS.—

1. W OTOTO:							
Dams and Appurtenant Works.							
A Preliminary Expenses.							
<ol> <li>Survey of the reservoir basins by Air photograph tours at 10 ft. —5ft. intervals on a scale of 4" — 40 square miles @ 375/- per sq. Mile.</li> </ol>	hy and a -1 Mile.	ground	survey	and plo	tting	con-	15,000
2. Survey of the dam sites and weir sites by air ph	notograp	hy and	, l groun	d survey	s and	i.	10,000
plotting on scale of 32"=1 mile. 1280 acres @ 4-0 per acre							5,120
3. Rapid 2" map of Dharoi dam site				•	·	·	2,000
4. Geological Investigation for foundations of the d	s and tu	nnellin	g, etc.	includa	the re	ser- ting.	46.000
46 holes each of 50—2300 R. Ft. @20/- per R.Ft 5. Soil analysis and burrows surveys for earther of					•	•	46,000
6. Model experiments by the Indian Waterways St		_			•	•	5,000 2,000
o. Model capellated by the indian woodways be	outlon 1	JOHN		•	•	•	
K. Buildings.							75,120
Temporary Buildings		_					10,000
II. Main Canals and Branches.	•	•	•	•	•		20,000
(a) Surveys of the commanded area for alignment	of canal	3					
1,20,000 acres @ 1-2-0 per acre		•		•	•	•	1,35,000
(b) Miscellaneous Surveys	•						5,000
(c) Longitudinal Section of the river and its tribute 25/- per mile.	aries wit	h cross	section	15 100 I	niles	@	2,500
(d) Soil Surveys, L.S.						•	2,400
(2) 1032 1021 1031	•	Ť	•	, ,	•		
TIT Dischange and Silt chargerstians (Davied Octob	an 1040	40 Mar	- 1050	90	+h~\	0	1,44,900
III. Discharge and Silt observations (Period Octob boatman and four khallasies at each discharge si gauges, silt samplers and laboratory equipment.	ite, cost	of rope	es, discl	arge ro	ds, flo	ats,	
4 sites at Rs. 5000/- per site per year for 20 mon	ths .	•			•	•	33,400
IV. Meteorological observations, raingauges temper observations		umidi	ty and	wind vel	ocity		2,000
V. Mineral Surveys	•	•	• •	•	•	٠.	5,000
VI. Surveys for Pisciculture			•				1,000
VII. Malaria Surveys.							2,000
VIII. Electrical Load Surveys		. '					10,000
IX. Economic and Property surveys							5,000
X. Communications		•	•		•	•	10,000
XI. Special Tools and Plant. 1 Diamond drill coneach.		vith ac		s @ Rs.	60,00	0.	60,000
Testing apparatus and lab equipment for compre				s, optim	um.	•	
moisture content, consolidation, etc.	•	•	•	•	•	•	11,000
							71,000
•							3,69,420
2% contingencies	•	•	•				7,388
Total works		•					3,76,808
II. TOOLS AND PLANT	- W0001						
1. Motor vehicles for survey parties. 7 vehicles @	<i>y</i> 7000/-	each	•	•	•	•	49,000
2. Working expenses for 15 months	•	•	•	•		•	22,000
3. Scientific instruments and drawing materials . 4. Ordinary Tools and Plant	•	•		•	•	•	30,000 5,000
5. Camp equipage	•			•	•	•	15,000
6. Office Furniture					•	:	15,000
7. R & C of T & P	•						5,000
							1,41,000
2% contingencies	•						2,820
Total tools and Plant					:		1,43,820
TITE IN COME A TIME WASHINGTON ATTORNEY						•	-,,
III. ESTABLISHMENT  1. Pay of Officers—							
Executive Engineer 1 No. @ 875/- p.m. for 15 mor	nthe						lo tus
Assistant Engineers 3 No. @ 560/-p.m. for 15 month		•		•	•	•	13,125 25,200
Asstt. Geologist I No. @ 500/ p.m. for 6 months.				•			3,000
Drill Foreman 1 No. @ 1000/- p.m. for 6 months.				•	•	•	6,000
•							
							47,325

2. Pay of Establishment.								
Accountant 1 No. @200/- p.m for 15 months .								3,000
Head Clerk 1 No. @180/- p.m. for 15 months .	•	•	•	•	•	•	•	2,700
Senior Clerk 3 Nos. @ 150/- p.m. for 15 months .	•			•	•	•	•	6,750
Storekeeper 1 No. @ 150/- p.m. for 15 months .	•	•	•	٠	•	•	•	2,250
Senior Draftsman 1 No. @ 200/- p.m. for 15 months		•	•	•	•	•	•	3,000
Junior Clerks 7 Nos. @ 93/- p.m. for 15 months .	• •	•	•	•	•	•	•	9,765
Junior Draftsman 1 No. @ 143/- p.m. for 15 months	•	•	•	•	•	•	•	2,145
Tracers 2 Nos. @ 104/-p.m. for 15 months	•	•	•	•	•	•	•	3,120
Sub-Assistant Surgeon @ 170/- p.m. for 15 months	•	•	•	•	•	•	•	2,550
Compounder 1 No. @ 50/- p.m. for 15 months .	•	•	•	•	•	•	•	750
Overseers 12 Nos. @ 240/- p.m. for 15 months.	•	•	•	•	•	•	•	43,200
Research Assistant 1 No. @ 240/- p.m. for 15 months.		•	•	•	•	•	•	3,600
Laboratory Asstt. 1 No. @230/- p.m. for 15 months		•	•	•	•	•	•	3,450
Silt Analyst 1 No. @ 200/- p.m. for 15 months .	•	•	•	•	•	•	•	3,000
Asstt. Silt Analyst 1 No. @ 93/- p.m. for 15 months	•	•	•	•	•	•	•	1,395
Gauge readers 5 Nos. @ 70/- p.m. for 15 months	•	•	•	•	•	•	•	-
Senior Observers 4 Nos. @ 90/- p.m. for 15 months.	•	•	•	•	•	•	•	5,250
Daffadars 4 Nos. @ 33/- p.m. for 15th months .		•	•	•	•	•	•	5,400
Barkandazes 5 Nos. @ 33/- p.m. for 15 months .	•	•	•	•	•	•	•	1,980
Peons 13 No. @ 33/- p.m. for 15 months	•	•	•	•	•	•	•	2,475
Khallasies for overseers 12 Nos. @ 33/- p.m. for 15 n	• • • • • • • • •	•	•	•	•	•	•	6,435
		•	•	•	•	•	•	5,940
Laboratory Khallasies 3 Nos. @ 33/- p.m. for 15 mo	nuns	•	•	•	•	•	•	1,485
Chowkidars 5 Nos. @ 33/- p.m. for 15 months .	•	•	•	•	•	•	•	2,475
Dak Runners 5 Nos. @ 33/- p.m. for 15 months .	•	•	•	•	•	•	•	2,475
Ferroprinter 1 No.@ 60/- p.m. for 15 months .	•	•	•	•	•	•	•	900
Daftri 1 No. @ 33/- p.m. for 15 months	, ,	•	•	•	•	•	•	495
Special pay for 3 Clerks for handling cash for 15 mor	trus @	20/- I	o.m.	•	•	•	٠	900
								1,26,885
3. Dearness Allowance for Officers for 15 months. 4. Dearness Allowance for establishment for 15 mon	tha.	•	•	•	•	•	•	7,000
5. Travelling allowance for officers for 15 months.	uis.	•	:	:	•	•	•	38,000 20,000
6. Travelling allowance for establishment for 15 mor	ths	•	•	•	•	•	•	15,000
7. Establishments contingencies (for 15 months).	•	•	•	•	•	•	•	12,000
Total Establishment	•	•	•				•	2,66,210
Total Establishment	•	•	•	•	•	•	٠	2,66,210
Total Establishment TOOLS AN	D PL	ANT.	٠	•	•	•	• -	2,66,210
TOOLS AN	D PL	· ANT.	•	٠	•	•	•	2,66,210
	ID PL	ANT.	٠	•	•	•	•	2,66,210
TOOLS AN	· ID PL	ANT.		•	•			49,000
TOOLS AN  1. Plant and Machinery.	· id PL  .	· ANT. ·			•			
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	· ID PL/	· ANT. ·			•			49,000 22,000
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	· id PL  .	ANT.			·			49,000
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months	· ID FL	ANT.			•			49,000 22,000
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials	· ID PL  .	ANT.			·		· -	49,000 22,000 71,000
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each	· id PL  . , ,	ANT.		•	•			49,000 22,000 71,000
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each  Folding footrules 12 No. @ 7/- each	OD PL	ANT.			•		· -	49,000 22,000 71,000 10,200 84
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each  Folding footrules 12 No. @ 7/- each  Plotting scales 12 No. @ 30/- each					· · · · · · · · · · · · · · · · · · ·			49,000 22,000 71,000 10,200 84 360
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each  Folding footrules 12 No. @ 7/- each  Plotting scales 12 No. @ 30/- each  Set Squares transparent 8" (45° and 60°), 12 pairs @			·		·		· -	49,000 22,000 71,000 10,200 84 360 180
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each  Folding footrules 12 No. @ 7/- each  Plotting scales 12 No. @ 30/- each  Set Squares transparent 8" (45° and 60°), 12 pairs @ 1st quality Drawing Instrument box 1 No. @ 160/- each	15/- po	· · · ·	·		•			49,000 22,000 71,000 10,200 84 360 180 160
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·			49,000 22,000 71,000 10,200 84 360 180 160 760
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·					49,000 22,000 71,000 10,200 84 360 180 160 750 30
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·					49,000 22,000 71,000 10,200 84 360 180 160 750 30
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·					49,000 22,000 71,000 10,200 84 360 180 160 750 30
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·		49,000 22,000 71,000 10,200 84 360 180 160 750 30
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·		49,000 22,000 71,000 10,200 84 360 180 160 750 30 300 250
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·					49,000 22,000 71,000 10,200 84 360 180 160 750 30 300 250 2,800
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each  Folding footrules 12 No. @ 7/- each  Plotting scales 12 No. @ 30/- each  Set Squares transparent 8" (45° and 60°), 12 pairs @ 1st quality Drawing Instrument box 1 No. @ 160/- e 2nd quality Drawing instrument boxes 12 Nos. @ 62/s French curve set 1 No. @ 30/- each  Parallel rulers 5 Nos. @ 60/- each  Survey Umbrellas 4 Nos. @ 62/8 each  Theodolite 1 No. @ 2800/- each  Levelling Staves 16 pairs @ 150/- per pair One hundred feet chains 16 Nos. @ 40/- each  100' Metallic Tapes 20 No. @ 30/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·					49,000 22,000 71,000 10,200 84 360 180 160 750 30 300 250 2,800 2,400
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each  Folding footrules 12 No. @ 7/- each  Plotting scales 12 No. @ 30/- each  Set Squares transparent 8" (45° and 60°), 12 pairs @ 1st quality Drawing Instrument box 1 No. @ 160/- e 2nd quality Drawing instrument boxes 12 Nos. @ 62/s French curve set 1 No. @ 30/- each  Parallel rulers 5 Nos. @ 60/- each  Survey Umbrellas 4 Nos. @ 62/8 each  Theodolite 1 No. @ 2800/- each  Levelling Staves 16 pairs @ 150/- per pair One hundred feet chains 16 Nos. @ 40/- each  100' Metallic Tapes 20 No. @ 30/- each  50' Metallic Tapes 20 No. @ 30/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·					49,000 22,000 71,000 84 360 180 160 750 30 300 250 2,800 2,400 640
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·					49,000 22,000 71,000 84 360 180 160 750 30 300 250 2,800 2,400 640 600
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·		49,000 22,000 71,000 84 360 180 160 750 30 300 250 2,800 2,400 640 600 480
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·		49,000 22,000 71,000 84 360 180 160 750 30 300 250 2,800 2,400 640 600 480 500
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each	15/- po	· · · ·	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·		49,000 22,000 71,000 84 360 180 160 750 30 300 250 2,800 2,400 640 600 480 500 1,240
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each  Folding footrules 12 No. @ 7/- each  Plotting scales 12 No. @ 30/- each  Set Squares transparent 8" (45° and 60°), 12 pairs @ 1st quality Drawing Instrument box 1 No. @ 160/- e 2nd quality Drawing instrument boxes 12 Nos. @ 62/5 French curve set 1 No. @ 30/- each  Parallel rulers 5 Nos. @ 60/- each  Survey Umbrellas 4 Nos. @ 62/8 each  Theodolite 1 No. @ 2800/- each  Levelling Staves 16 pairs @ 150/- per pair  One hundred feet chains 16 Nos. @ 40/- each  100' Metallic Tapes 20 No. @ 30/- each  Plane-tables with stand 5 No. @ 100/- each  Prismatic compasses 4½" dia. 4 No. @ 310 each  Ranging Rods 72 No. @ 5/- each	15/- po	· · · ·				· · · · · · · · · · · · · · · · · · ·		49,000 22,000 71,000 84 360 180 160 750 30 300 250 2,800 2,400 640 600 480 500 1,240 360
1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each  Folding footrules 12 No. @ 7/- each  Plotting scales 12 No. @ 30/- each  Set Squares transparent 8" (45° and 60°), 12 pairs @ 1st quality Drawing Instrument box 1 No. @ 160/- e 2nd quality Drawing instrument boxes 12 Nos. @ 62/s French curve set 1 No. @ 30/- each  Parallel rulers 5 Nos. @ 60/- each  Survey Umbrellas 4 Nos. @ 62/8 each  Theodolite 1 No. @ 2800/- each  Levelling Staves 16 pairs @ 150/- per pair  One hundred feet chains 16 Nos. @ 40/- each  100' Metallic Tapes 20 No. @ 30/- each  50' Metallic Tapes 20 No. @ 30/- each  Plane-tables with stand 5 No. @ 100/- each  Prismatic compasses 4½" dia. 4 No. @ 310 each  Ranging Rods 72 No. @ 5/- each  Large size stanley planimeter 1 No. @ 400/- each	15/- po ach /8/- eac	· · · ·				· · · · · · · · · · · · · · · · · · ·		49,000 22,000 71,000 84 360 180 160 760 30 300 250 2,800 2,400 640 600 480 500 1,240 360 400
1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each Folding footrules 12 No. @ 7/- each Plotting scales 12 No. @ 30/- each Set Squares transparent 8" (45° and 60°), 12 pairs @ 1st quality Drawing Instrument box 1 No. @ 160/- e 2nd quality Drawing instrument boxes 12 Nos. @ 62/s French curve set 1 No. @ 30/- each Parallel rulers 5 Nos. @ 60/- each Survey Umbrellas 4 Nos. @ 62/8 each Theodolite 1 No. @ 2800/- each Levelling Staves 16 pairs @ 150/- per pair One hundred feet chains 16 Nos. @ 40/- each 100' Metallic Tapes 20 No. @ 30/- each 50' Metallic Tapes 20 No. @ 30/- each Prismatic compasses 4½" dia. 4 No. @ 310 each Ranging Rods 72 No. @ 5/- each Large size stanley planimeter 1 No. @ 400/- each Small size planimeter 1 No. @ 250/- each Stop watches 5 No. @ 100/- each Steel tapes 2 No. @ 70/- each Steel tapes 2 No. @ 70/- each Steel tapes 2 No. @ 70/- each	15/- po ach /8/- eac	· · · ·				· · · · · · · · · · · · · · · · · · ·		49,000 22,000 71,000 84 360 180 160 750 30 300 250 2,800 2,400 640 600 480 500 1,240 360 400 250
TOOLS AN  1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each Folding footrules 12 No. @ 7/- each  Plotting scales 12 No. @ 30/- each  Set Squares transparent 8" (45° and 60°), 12 pairs @ 1st quality Drawing Instrument box 1 No. @ 160/- e 2nd quality Drawing instrument boxes 12 Nos. @ 62 French curve set 1 No. @ 30/- each  Parallel rulers 5 Nos. @ 60/- each Survey Umbrellas 4 Nos. @ 62/8 each  Theodolite 1 No. @ 2800/- each  Levelling Staves 16 pairs @ 150/- per pair One hundred feet chains 16 Nos. @ 40/- each  100' Metallic Tapes 20 No. @ 30/- each  50' Metallic Tapes 20 No. @ 30/- each  Prismatic compasses 4½" dia. 4 No. @ 310 each  Ranging Rods 72 No. @ 5/- each  Large size stanley planimeter 1 No. @ 400/- each  Small size planimeter 1 No. @ 250/- each  Stop watches 5 No. @ 100/- each  Stop watches 5 No. @ 100/- each	15/- po ach /8/- eac	· · · ·				· · · · · · · · · · · · · · · · · · ·		49,000 22,000 71,000 84 360 180 160 750 30 300 250 2,800 2,400 640 600 480 500 1,240 360 400 250 500
1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each Folding footrules 12 No. @ 7/- each Plotting scales 12 No. @ 30/- each Set Squares transparent 8" (45° and 60°), 12 pairs @ 1st quality Drawing Instrument box 1 No. @ 160/- e 2nd quality Drawing instrument boxes 12 Nos. @ 62/s French curve set 1 No. @ 30/- each Parallel rulers 5 Nos. @ 60/- each Survey Umbrellas 4 Nos. @ 62/8 each Theodolite 1 No. @ 2800/- each Levelling Staves 16 pairs @ 150/- per pair One hundred feet chains 16 Nos. @ 40/- each 100' Metallic Tapes 20 No. @ 30/- each 50' Metallic Tapes 20 No. @ 30/- each Prismatic compasses 4½" dia. 4 No. @ 310 each Ranging Rods 72 No. @ 5/- each Large size stanley planimeter 1 No. @ 400/- each Small size planimeter 1 No. @ 250/- each Stop watches 5 No. @ 100/- each Steel tapes 2 No. @ 70/- each Steel tapes 2 No. @ 70/- each Steel tapes 2 No. @ 70/- each	15/- po ach /8/- eac	· · · ·				· · · · · · · · · · · · · · · · · · ·		49,000 22,000 71,000 84 360 180 160 750 30 300 250 2,800 2,400 640 600 480 500 1,240 360 400 250 500 140
1. Plant and Machinery.  Motor vehicles 7 No. @ 7000/- each  Working expenses for 15 months  2. Scientific instrument and Drawing materials Levels 12 No. @ 850/- each  Folding footrules 12 No. @ 7/- each  Plotting scales 12 No. @ 30/- each  Set Squares transparent 8" (45° and 60°), 12 pairs @ 1st quality Drawing Instrument box 1 No. @ 160/- e 2nd quality Drawing instrument boxes 12 Nos. @ 62  French curve set 1 No. @ 30/- each  Parallel rulers 5 Nos. @ 60/- each  Survey Umbrellas 4 Nos. @ 62/8 each  Theodolite 1 No. @ 2800/- each  Levelling Staves 16 pairs @ 150/- per pair  One hundred feet chains 16 Nos. @ 40/- each  100' Metallic Tapes 20 No. @ 30/- each  Plane-tables with stand 5 No. @ 100/- each  Prismatic compasses 4½" dia. 4 No. @ 310 each  Ranging Rods 72 No. @ 5/- each  Large size stanley planimeter 1 No. @ 400/- each  Small size planimeter 1 No. @ 250/- each  Stop watches 5 No. @ 100/- each  Stop watches 5 No. @ 70/- each  Drawing boards with T. Square 7 No. @ 50/- each	15/- po ach /8/- eac	· · · ·				· · · · · · · · · · · · · · · · · · ·		49,000 22,000 71,000 84 360 180 160 750 30 300 250 2,800 2,400 640 600 480 500 1,240 360 400 250 500 140 350

6" celluloid se	micircular prot	tractors	4 No	. @	5/- eac	sh .							20
Abney levels 1	n case with sta	and 2 N	fos. @	360	)/- eacl	h.							720
36" straight e	ige 1 No. @ 7	2/- each	ı .										72
_	•			٠	•	•	•	•	•	•	•	•	
	ompasses 2 No	_		ц.	•	•	•	•	•	•	•	•	60
Current meter	s 4 No. @ 1,00	)0/- eac	h.	•	•	•	•	•	•	•	•	•	4,000
Magnifying glo	asses 5 No. @	16/- eac	ch	•	•	•	•	•	•	•		•	80
Blue print app	aratus 1 No. (	<b>@</b> 600/-	erch		•	•	•	•	•	•	•		600
Camera I No.	@ 300/- each	•		٠	•	•	•	•	•				300
Prismatic bino	culars 2 No. @	250/-	each										500
66' measuring	chains 5 No. @	ௐ 30/- €	each										150
Colour boxes o	omplete 3 No.	@ 50/-	-each		•			•					150
China Slops for	r colours 12 No	o. @ 2/-	- each									•	24
	Total .	•	•	•	•	•	•	•	•	•	•	•	30,000
3. ()rdinary Too	ls and Plant.												
Augers 20 No.										•	_	_	2,000
Carpenters axe	- '	- each							•	•	•	•	120
Country axes 3	<del>-</del> .					•	•	•					240
G.I Buckets 24	_											•	96
Hammers of su	_												144
Stone breaking	hammers 12 N	No. @ 8	B/- eac	h		,							36
Copper ghadas	for water 10 N	Го. @ 1	5/- ea	ch									150
fron pegs and r	ails L. S	•											100
Pick axes 48 N	o. @ 6/- each	•	•							•			288
Brass Plumbs 2	4 No. @ 3/- es	ach	•										72
Hand Saws 12	No. @ 8/ each	•	•		•	•	•	•		:		•	96
Stencil plate fig	_	29/- ead	sh.		•		•	•	•			•	29
Stencil plate let	ters 1 No. @	30/-	each	•	•		•		•		•	•	30
Fire buckets 48	No. @ 8/- eac	<b>h</b>	•	•	٠	•	•	٠	•	•		•	384
Nail extractors	•	- each	•	•	•	٠	•			•	•	•	63
Phahorahs 48 N	•	•	•	•	٠	•	•	•	•	٠	٠	•	480
Crowbars 24 No	. @ 25/- each	•	•	•	•	•	•	•	•	•	•	•	600
Sundries	• •	•	•	•	. *	•	•	•	•	•	•	•	72
	Total					_							F 000
	*****	•	•		•	•		•	•	•	•	•	5,000
												-	
. amp Lquipage	_												
Chairs folding 13		sh.			•								3.64
Tables camp fold			ch			•	•	•	•	•	٠	•	192
Swiss cottage do	_			2' @	1000	Agr	h	•	•	•	•	•	480
Double fly tents							-			•	•	•	1,000
Shouldaries 12 N								•		•	•	•	7,000 6,000
Necessary tent 1										,	•	•	6,000 100
Country charpoy				•					•				192
Sundries										•		•	36
					•								
													15,000

#### 5. Office Furniture.—

	Officer's Writing tables 1 No. @ 170/- each	1	•								170
	Writing tables $5' \times 3' \times 2\frac{1}{2}'$ /with oil cloth	6 N	o. @ 1	25/- ea	ach						750
	Writing table with 2 drawers 25 No. @ 10	0/- e	ach								2,500
	Office chairs 50 No. @ 20/- each										1,000
	Easy chairs 6 No. @ 35/- each .										210
	Cupboards 6' × 4' × 1½' 16 No. @ 125/-	ach	•								2,000
	Record stands $4' \times 3\frac{1}{2}' \times 1\frac{1}{2}'$ 16 No. @ 40	)/- <b>e</b> a	ch					-			640
	Steel trunks 16 No. @ 25/- each .		•								400
	Cupboards 4' × 3' × 1½' 16 No. @ 60/- ea	ch	•								960
	Benches with backs (5' $\times$ 15" $\times$ 18") 7 N	o. @	30/-ea	ch							210
	Steel stamp boxes 6 No. @ 10/- each										60
								•			500
	Teapoys 16 Nos. @ 20/- each		•								320
	Cupboards $4' \times 3' \times 5'$ with 6 drawers es	ach 8	3" high	for p	lans	6 No. (	@ 15	0/- each	ì.		900
	Waste paper baskets 14 No. @ 2/- each			•						•	28
	Call Bells 12 No. @ 4/- each				•						48
	Peon belts 13 No. @ 5/- each .									•	65
	High Chairs for tracers 2 No. @ 20/- each						•	•			40
	Chamber pot 1 No. @ 5/- each .							•			5
	Locks 36 No. @ 3/- each				•	•		•			108
	Brass pad looks 8 Nos. @ 15/- each								٠.	. •	. 120
	Pigeon holes for despatch clerks 5 No. @	25/-	each	•		•	•	•	•	•	125
	Scales and weights 5 No. @ 20/- each		•	•	•			•	•	•	100
	Steel cash boxes 5 No. @ 25/- each .		•			•	•	•	•	•	125
	Portable type writer 1 No. @ 300/- each					•	•	•	**	•	300
	Standard type writer 1 No . @ 450/- each					•		•	•	•	450
	Hurricane Lanterns 24 No. @ 5/- each				•	•	•	•	•	•	120
	Table Lamps 10 No. @ 25/- each .				•	•	•	•	•	•	250
	Cycles 2 No. @ 225/- each		•	•	•	•	•	•	•	•	450
	Safes 4 No. @ 400/- each			•	•	•	•		•	•	1,600
	Stools wooden 12 No @ 6/- each .			•		•	•	•	•	•	72
	Sundries		•	•		•	٠.	•	•	•	374
	m + 3									_	15,000
	Total	•	•	•	•	•	•	•	•	• -	20,000
6.	R. & C. of T & P	•	•	•	•	•	•	٠	•	•	5,000

	Yearly	distr	ibutr	on of	the an	nount	of the	forego	oi <b>n</b> g es	timate	
										Year 1948-49	Year 1949-50
I. WORKS										1010-10	1010 00
(i) Preliminary Expenses.											
1. Survey of reservoir ba	sin						•			7,500	7,500
2. Survey of Dam Site	•									5,120	• •
3. Rapid 2" map of Dha	oı dam	site			•				•	2,000	••
4. Geological investigation	ons						•			••	46,000
5. Soil analysis etc.	•						•			5,000	••
6. Model Experiments				•						• •	2,000
(ii) Buildings.											
Temporary Buildings	•	•		•		•		•		10,000	••
(iii) Main Canals and Bran	iches.										
1. Survey of the comman	aded are	8,								67,500	67,500
2. Miscellaneous Surveys		•	•			•				• •	5,000
3. Longitudinal Section of	of the ri	ver								2,500	••
4. Soil Surveys .	•									2,400	
(iv) Discharge and silt obser	vation								•	20,000	1 <b>3,4</b> 00
(v) Meteorological Observat	ions				•					2,000	
(vi) Mineral Surveys .			•							5,000	••
(vii) Surveys for Piscicultur	e .									• •	1,000
(viii) Malaria Surveys .	•									2,000	
(ix) Electric Load Surveys										••	10,000
(x) Economic and Propert	y Survey	ys								2,500	2,500
(xi) Communications .				•						10,000	• •
(xii) Special Tools and pla	nts										60,000
(xivi) Testing Apparatus an	d lab eq	ui]m	rent.			•				11,000	• •
Contingencies.	•			•	•		•	•		2,555	4,995
										1 55 055	010005
II. TOOLS AND PLANTS										1,57,075	2,19,895
Tools and Plants .		•								1,43,820	
III. ESTABLISHMENT			•							1,33,105	1,33,105
		,			•	•	-	-	-		-,00,100
Gran	d Total			•			•			4,34,000	3,53,000

(Sd.) M. D. MITHAL. Director, Irrigation and Waterways

# APPENDIX VII C. P. & BASTAR PROJECTS.

Central Provinces & Berar together with Bastar State which has recently merged into this province are one of the richest provinces of India in minerals. There are vast deposits of coal, bauxite, iron, copper, manganese, limestone etc. etc. The quality of coal found, however, is rather inferior and on that account practically no industrial use of the mineral wealth of the tract has so far been attempted. Surveys for the purpose of utilising the water resources of the area were undertaken about thirty years ago but the results were surprisingly disappointing. In the main it was brought out that inspite of the copious rainfall over the entire area the resources could not be utilised to produce cheap power or cater for much irrigation! At the request of the C. P. Government a fresh survey was undertaken by the CWINC and it was discovered that potential for power exceeded one million K. Ws. and water could also be made available for perennial irrigation of nearly a million acres of cultivated and cultivable land.

In Bastar State at the request of the State Ministry a similar survey was carried out. This State has about the richest iron ore deposits concentrated in two small areas one on either side of the river Indravati. The percentage of iron in the ores is believed to be from 68 to 70. Potential of power on the Indravati river was found to be nearly 300,000 K. Ws. continuous. The plateau of Jugdalpore was similarly discovered to be in a very undeveloped state, only a small portion being utilised for cultivation while actually cultivation could be extended over a much larger level and fertile area.

The possibilities of development were discussed with the Government of C. P. & Berar and their technical officers and at a conference held in April, 1947 it was decided to select 8 projects besides those on the Narbada and Tapti for investigations with a view to prepare the detailed development estimates. C. P. Government also desired that the work of investigations should be done by the CWINC. The sites selected for investigations are given in the accompanying list in which other details of the projects are also shown. Similarly the projects for Bastar State have also to be investigated by CWINC. Details of the projects in that area are also shown in the list. The estimate amounting to Rs. 71,17,140/- has been prepared to cover the cost of necessary work involved in the surveys and investigations. It is proposed to set up a Circle with three divisions and requisite number of subdivisions, subordinates and ministerial staff to man the work of investigations. As in other programmes of investigations, survey works of dam sites, reservoir areas, areas to be commanded for irrigation will be completed through the agency of the Survey of India Department. Hydrological surveys and Geological surveys will be done in close co-operation with the Indian Meteorological Department and Geological Survey of India respectively. Provision has also been made for surveys for malaria control, fish culture, navigation, soil-conservation etc. Provision for the acquisition of necessary plant for geological and hydrological and other surveys has been adequately made. The work is estimated to take four years to complete. The principal feature of the 12 projects, 8 in C.P. and Berar and 4 in Bastar state are shown in accompanying statement.

Index map showing dam sites etc. is enclosed.

K. M. BHATIA, Project Officer, C. W. I. N. C.

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Minimum Minimum prwer (In pewer (Pro- power (In K.W. tonnec- Irrigation Po- K.W. ton with tential other projects)  E.W. projects)	14 15 16	6300 6300 1,00,000	1800 1800 50,000	13400 13400 3,00,000	4370 4370 75 000	6360	2000	6520 6520 3,00,000	5000 5000 , 1,50,000	27000 27000 very little		14400 22000 6,90,000
Submerged area in acres	13	15870	15488	35200	24000	48000	2000	16448	28000		154000	64000
Length of Capacity 8 water in million spread at A. Bt. dam in thousand feet	12	662	36	1.482	0.533	1.22	$1 \cdot 22$	.893	$1 \cdot 22$		, 8.75	<b>62</b> 4
	111	11.12	8.745	2.97	6.765	4.455	,746	1.6	5.280		5.280	1.980
Approx. height of dam above bed of river in feet	10	125	75	120	116	110	112	120	7.7		160	100
R. L. of top of proposed dam above M.S.L.	6	1750	1450	1600	1150	1140	880	1050	1207		450	800
Catchment area in sq. miles	80	1416.8	1377.28	1596.8	1726.72	1196.8	1227.2	3000	1133	5000	16312	2744
Approx. distance from head in miles	7	122 miles on Konben miros	100	252	7.0	37	68	104	62		102	
Maps in which the dam & water spread falls	9	58 0/5,1	65N/ 15& 64/B/3	56E/5,1 55H/4 55D/16	56, K/3,7	64H/14 & L/2	64M/14 64 K/10 64/K/10	11.12 64 J/11,10 64 J/11	64 M/6 64 N/6, 7, 10	II	65B/5 65 A/4,8	B/1, 5, 9
Names of States or provinces in which dam and water sp-	70	C. P.	C. P.	C. P. & a little of Hydera-	bad C. P.	C. P.	C. P.	G. P.	C. P. & Eastern States	Eastern States Eastern States	C. P. & Eastern	States C. P. & Eastern States
Longitude Names of & latitude States or of left provinces bank at in which dam aide water sp.	4	79°16′ E 21°43′ N	80° E 22°23′ N	77°22' E 19°53' N	78°5′ E 21°23′ N	81°59′ 30″ E	20°41' N 82°33' E 21°35' 30"	N 82°42′ 30″ E E 22°28′ 30″	N 81°28′ E 20°33′ 46″ N	81°43' E 19°12' N 81°24' E 19°12' N	80°18′ E 18°47′ N	81°52′ E 18°35′ N
Name of Nearest village	ಣ	North of Alkata	North of Khapa	At Amti	East of Morai	North of Nirai &	Mohera East of Uprani	North of Lotlota	At Satia- ra		Bhopalpat- nam	Gumma
Name of tributary	2	Pench River	Wainganga river	renganga river	Wardha river	Pairi rıver	Jonk River	Hasado	Mahanadi '	Indravati river tributary of Godavari		Sabarı
SI. No.	-	- 0	N 6	9	₩ 1	ò	9	4	xo ·	10 }		12

## C. P. & BASTAR PROJECTS

Overall estimate for the preliminary surveys and investigations on 12 projects in the Central Provinces and Bastar State. (4 in upper Mahanadi basin, 4 in middle Godavari basin, and 4 in Bastar State).

#### ABSTRACT

I. WORKS										
(I) Dams and Appurtenant	Wo	rks.								
										Rs.
(A) Preliminary Expenses	•	•	•	•	•	•	•	•		6,80,000
(K) Buildings	•	•	•	•	•	•	•	•	•	1,50,000
(II) Main canals and branches	3	•	•	•	•	•	•	•	•	10,60,000
(III) Discharge observations	•	•	•	•	•	•	•	•	•	3,10,000
(IV) Silt Observations .	•	•	•	•	•	•	•	•	•	1,37,200
(V) Property Surveys .	•	•	•	•	•	•	•	•	•	28,800
(VI) Meteorological Surveys (VII) Geological Surveys	•	•	•	•	•	•	•	•	•	1,08,720 19,61,040
(VIII) Communications .	•	•	•	•	•	•	•	•	•	1,50,000
(VIII) companications .	•	•	•	•	•	•	•	•	•	
							201 0			45,85,760
							2% Con _	•		92,000
•							TOTAL V	W orks	•	46,77,760
II. TOOLS AND PLANTS . III. ESTABLISHMENT .	•	•	•	•	•	•	•	•	•	4,46,000 19,93,380
III. ESTABLISHMENT .	•	•	•	•	•	•	•	•	•	19,90,000
							7	LATO	•	71,17,140
Distribution—										
1/3 debitable to Upper Ma	ahana	adi ba	sin					_		23,72,380
1/3 debitable to middle				·	Ċ	·	·	·	•	23,72,380
1/3 debitable to Bastar 8						•				23,72,380
Allotments required.		1							•	,-,
lst ye	ear	2nd	year	3rd	yea	r 4t	h year			
16,52	,000	20,6	<b>5,</b> 000	17,0	0,00	00 1	7,00,000	)		
			DET	AIL	3					
[, WORKS										
	Work	8.								
(A) Preliminary expenses.										
(a) Surveys to be carried out I	by S	Survey	of In	dia.						
Reservoir Surveys.—							•••			
Pairi	•	•	•	•	•		q. miles	3		
Jonk	•	•	•	•	•	78	do.			
Hasado	•	•	•	•	•	26	do.			
Mahanadi	•	•	•	•	•	44	do.			
Bhopalpatnam	•	•	•	•		241 ° 100	do.			
Sabri	•	•	•	•			do. do.			
Chitrakot & Barasur .	•	•	•	•	•	300 25	do.			
Pench	•	•	•	•	•	25	do.			
Wain ganga Pain ganga	•	•	•	•	•	55	do.			
Wardha	•	•	•	•	•	38	do.			
waidia	•	•	•	•	•					
						1,007	do,			
1,007,sq. miles @ 375/- per sq.	mile									3,80,000
(b) Surveys to be carried out by	u C.	W. I.	. N. O	•			_			
Longitudinal Sections and surveys, special reservior surv	othe	r misc piscie	ellane ulture	ous su etc.	ırve	ys lik	e canal	alignm	ent	
12 sites @ 25,000/- per sit	θ Θ	•	•	•	•	•	•	•	•	3,00,000
										• 6,80,000
(m) m 17.1										
(K) Buildings — Temporary buildings—Lu	mn S	mur	_	_		_				1,50,000
(II) Main canals and brane	_		•	•	-	•	•	•	-	_,,
Survey of irrigation area.										
19.75.000 cares @ /0/	nor	O OTO								10,60,000

18,75,000 acres @ /9/- per acre . .

10,60,000

	•	)O							
(III) Discharge observations (No. of site	s-12)	(one a	t each	proje	ct site	9)			
Expenditure per site	•					•	(no	n-recurr	ing)
1 current meter @ 1,200/									.,200
I large boat @ 1,000/									,000
1 small boat @ 500/								_	500
l set velocity rods @ 200/-		-	•			·			200
1 set sounding rods @ 100/-	-		•	•	•		•		100
Ropes etc	•	•	•	•	•	•	•		
Chronometers	• •	•	•	•	•	•	•		600
Rack & Pinion arrangement	• •	•	•	•	•	•	•		200
Anchors		•	•	•	•	•	• •	•	200
Anchors ,	• •	•	•	•	•	•	•		1,000
(b) Recurring.									5,000
1 gauge reader @ 75/- for 4 years	•	•							3,600
1 Boatman @ 60/- p,m. for 4 year	rs	•							2,880
6 Khalasies @ 50/- for 4 years •		•		•	•				4,400
•									0,880
Fotal for one site				•					25,880
Total for 12 sites									2 10 000
•	•	•	•	•	•	•	•		3,10,000
(IV) Silt observations									
(i) Equipment non-recurring $@1$	00 <b>0/-</b> n	er site						•-	12,000
(ii) 12 silt observers @ 100/- for					•	Ĭ.	· ·	••	57,600
(iii) 16 khalasis for 4 years @ 50			Ċ		•	·	·	••	·
(iv) Miscellaneous on carriage and			·	•	•	•	•	••	10,000
, ,		F	•	•	•	•	• -	••	10,000
								_	1,37,200
(V) Property Surveys.—									
2 surveyors @ 100/- p.m. for 3 year	ars .	_							7 900
12 khalasis @ 50/- p.m. for 3 year			· ·		•	•	•	••	. 7,200
O to, Possible o Jour		•	•	•	•	•	٠	••	21,600
									28,800
(VI) Meteorological Surveys.							_		
(a) Equipment non-recurring.									
60 new rain gauges @ 500/- ea	ch	_							1 20 000
(b) Recurring.	<b></b> , •	•	•	•	•	•	•	••	[ 30,000
2 Meteorological Assistants @	200/ ₌ fo	or 4 7700	190						10.000
2 Senior observers @ 120/- for			1.5	•	•	•	•	••	19,200
60 part-time observers @ 16/- f	or 4 ye	ears .	:	:	:	:	•	••	11,520 48,000
							_		48,000
	$\mathbf{T}$	otal Me	teoro	logical	Surv	eys			1,08,720
(VII) Geological Surveys.							_		
(a) Equipment non-recurring.									
8 Diamond Drills @ 75,000/- ea	-7-								
Diamonds and other spares @ 4	LO 0007	- per se	t .	•	•	•	•	• •	6,00,000
2 calyx drills 5"-6" complete wit	h eani	nment s	and sp	ares.	•	:	:	• •	3,20,000 <b>50,0</b> 00
o special posts for drills @ 2000	)/- eacl	à.		•				• •	16,000
Testing apparatus	•	•	•	•	•				1,00,000
							-		70.00.000
(1) Paramira a							1_		10,86,000
(b) Recurring expenditure.									
(3 years operations	are co	nsidered	i enc	ough).					
1 Geologist @ 800/- p.m. for 3 yes	ers .	•	•	٠.	•				28,800
2 Assistant Geologist @ 400/- fo	r 3 yes	ars .	•						28,800
1 Drill foreman @ 1000/- for 3 ye	ars .		•						36,000
8 Operators (1 per drill) @ 150/- i	or 3 ye	ears		•					43,200
48 helpers (6 per drill) @ 80/- for	3 yes	ars .							1,38,240
Fuel and other expenditure @ 20	,000/- ]	p.m. for	30 m	onths	•	•			6,00,000
Total for Geologi	oo1	*******					-		8,75,000
•	car sur	veys	•	•	•	•	٠		19,61,040
(VIII) Uommunications, Lump Sum									_
	•	•	•	•	•	•		• •	1,50,000
Total of Works	•	•		•					45,85,760
2% Contingencies								••	92,000
		G	PT	0m:- T	X7				
		CTRA]	אט די	OTAL V	VORK	٠.	•	• •	46,77,760
							~		

		•	99							
II. TOOLS AND PLANTS—										
(a) Camp equipment.										
12 tents 14'×14' @ 1.200/-	each.								••	14,40
30 tents 10'×10' @ 800/- ea	ch .							•		14,000
30 shouldaries @ 600/- each										18,000
30 servants tents @ 500/- es										15,000
Camp furniture					•	•	•		• •	7,200
•										78,600
II. (b) Other tools and plants. (i) Non-recurring									-	
15 3/4 ton weapon carrier trucks (	a. 7000/-	each								. 1,05,000
6 jeeps with trailers @ 7,000/- ea	ch .	•		·	·		•	•	•	. 42,000
12 outboard motors @ 1,000/- eac	h.	•	•	•	•	•	•	•	•	. 12,000 . 48,000
48 levelling instruments @ 1000/- 48 measuring chains @ 50/- each	_	:	•	•	•	:	:	:	•	2,400
48-100 ft. tapes @ 30/- each .		•	•	•	•	•	•			. 1,440
48-50 ft. tapes @ 20/- each . 8 Theodolites @ 2000/- each .		•	•	•	•	•	•	٠	•	. 960
15 binoculars @ 300/- each .	•	•	•	•	•	•	•	•	•	. 16,000 . 4,500
20 drawing boards @ 30/- each .	•		•				•		•	. 600
20 plane tables @ 150/- each .		•	•	•		•	•	•	•	3,000
12 Prismatic compass @ 150/- eac 4 planimeters @ 500/- each	3n .	•	•	•	•	•	•	•	•	. 1,80 ₀ 2,000
36 drawing instruments boxes 2nd	l class @	200/	- each	·	÷	÷	:	:	•	7,200
Scales with offsets, French curve			•				•		•	. 1,000
										9.46.040
										2,46,940
(ii) Recurring expenditure										
Repairs and carriage of scientific	instrum	anta f	or 4. 374	og.re						. 50,000
Running expenses for trucks and					•	•	•	•	•	. 1,50,000
running expenses for trucks and	leebs to	reye	2013	•	•	•	•	•	•	. 1,50,000
			•							2,00,000
mai		/2.\ ms	1							4.46.000
Tot	al (a) &	(b) T	oois si	ia Pi	ants	•	•	•	•	. 4,46,000
III. ESTABLISHMENT										
(Provision is for 4 years)										
1 Superintending Engineer @ 18	50/- p.m						. ~			. 88,800
3 Executive Engineers @ 800/- p				•		·	Ī	·		. 1,15,500
6 Assistant Executive Engineers			each	•	•	•	•	•	• •	1,72,800
	_			•	•	•	•	•	•	. 1,44,000
6 Assistant Engineers @ 500/- p.		•	•	•	•	•	•	•	•	. 14,400
1 Superintendent @ 300/- p.m.		•	•	•	•	•	•	•	•	
3 Head Clerks @ 200/- p.m. each			•	•	•	•	•	•	•	. 28,800
3 Accountants @ 200/- p.m. each	٠.	•	•	•	•	•	•	•	•	. 28,800
1 Stenographer @ 200/- p.m	•	•	•	•	•	•	•	•	•	. 9,600
18 Upper Division clerks including	8. D. C	's. @	100/-	p.m. (	each	•	•	•	•	. 86,500
32 Lower Division clerks @ 75/- p	.m. each	١.	•	•	•	•	•	•	•	. 1,15,000
3 Steno-typists @ 100/- p.m. each	h.						•			. 14,400
1 Head Draftsman @ 300/- p.m.					•					. 14,400
3 Senior Draftsmen @ 160/- p.m.	each									. 23,040
8 Draftsmen @ 100/- p.m. each.										. 38,400
8 Tracers @ 75/- p.m. each .	_			_						. 28,800
48 Overseers @ 150/- p.m. each .	•	-							_	. 3,45,000
3 Sub-Assistant Surgeons @ 150/	! nm a	och	•	•	•	•	•	•	·	. 21,600
			•	•	•	•	•	•	•	. 51,900
6 Research Assistants @ 180/- p.			•	•	•	•	•	•	•	
	_	en	•	•	•	•	•	•	•	. 36,000
6 Laboratory Assistants @ 125/-		•	•	•	•	•	•	•	•	. 10,800
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each	•			•	•	•	•	•	•	. 7,200
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each 3 Ward boys @ 50/- p.m. each .	•	•						•	•	. 1,920
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each	•	•	•	•	•	•	•			. 40,500
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each 3 Ward boys @ 50/- p.m. each .	•	•		:	•	:	•	•	•	. 20,000
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each 3 Ward boys @ 50/- p.m. each . 1 Jemadar @ 40/- p.m	· · · · · · · · · · · · · · · · · · ·	•	•	•	· ·	:	•	•		. 72,400
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each 3 Ward boys @ 50/- p.m. each 1 Jemadar @ 40/- p.m. 28 peons @ 30/- p.m. each 50 Barkandaz @ 30/- p.m. each	· · · · · · · · · · · · · · · · · · ·	· · · ·	•	•	•	•	· ·		•	
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each 3 Ward boys @ 50/- p.m. each . 1 Jemadar @ 40/- p.m 28 peons @ 30/- p.m. each . 50 Barkandaz @ 30/- p.m. each . 12 Daffadars @ 30/- p.m. each .		•	•	•		· · ·	•		•	. 72,400
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each 3 Ward boys @ 50/- p.m. each 1 Jemadar @ 40/- p.m. 28 peons @ 30/- p.m. each 50 Barkandaz @ 30/- p.m. each			· · · ·	•	•		•	•		. 72,400 . 17,300 . 1,920
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each 3 Ward boys @ 50/- p.m. each 1 Jemadar @ 40/- p.m 28 peons @ 30/- p.m. each 50 Barkandaz @ 30/- p.m. each 12 Daffadars @ 30/- p.m. each 1 Daftri @ 40/- p.m				•	•		•	•		. 72,400 . 17,300 . 1,920 . 11,93,380
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each 3 Ward boys @ 50/- p.m. each . 1 Jemadar @ 40/- p.m 28 peons @ 30/- p.m. each . 50 Barkandaz @ 30/- p.m. each . 12 Daffadars @ 30/- p.m. each .				•				•		. 72,400 . 17,300 . 1,920 . 11,93,380 . 3,00,000
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each 3 Ward boys @ 50/- p.m. each 1 Jemadar @ 40/- p.m. 28 peons @ 30/- p.m. each 50 Barkandaz @ 30/- p.m. each 1 Daffadars @ 30/- p.m. each 1 Daftri @ 40/- p.m.  Dearness allowance and increment							•	•	· · · · · · · · · · · · · · · · · · ·	. 72,400 . 17,300 . 1,920 . 11,93,380 . 3,00,000 . 3,00,000
6 Laboratory Assistants @ 125/- 3 Compounders @ 75/- p.m. each 3 Ward boys @ 50/- p.m. each 1 Jemadar @ 40/- p.m. 28 peons @ 30/- p.m. each 50 Barkandaz @ 30/- p.m. each 12 Daffadars @ 30/- p.m. each 1 Daftri @ 40/- p.m.  Dearness allowance and increment			·		· · · · · · · · · · · · · · · · · · ·					. 72,400 . 17,300 . 1,920 . 11,93,380 . 3,00,000

(Sd.) K. M. BHATIA,

Project Officer, C.W.I.N.C.

Estimates for preliminary surveys and investigations in connection with projects for multipurpose development in C. P. and Bastar State prepared in accordance with the suggestions of the Ad-Hoc Committee.

## (ABSTRACT)

I. WORKS—												
(I) Dams and Appurtenant	W	orks —										
(A) Preliminary expenses		•	•	•	•	•	•	•	•	•	•	<b>5,24,</b> 000
(K) Buildings	•	•	•	•	•	•	•	•	•	•	•	1,00,000
(II) Main canals and branc		•	•	•	٠	•	•	•	•	•	•	7,59,375
(III) Discharge observation	ıs	•	•	•	•	٠	•	•	•	•	•	1,65,280
(IV) Silt observations	•	•	•	•	•	•	•	•	•	•	•	70,600
(V) Property Surveys	•	•	•	•	•	•	•	•	•	•	•	28,800
(VI) Meteorological surveys		•	•	•	•	•	•	•	•	•	•	84,040
(VII) Geological Surveys	•	•	•	•	•	•	•	•	•	•	•	16,59,360
(VIII) Communications	•	•	•	•	•	•	•	•	•	•	•	1,00,000
												35,01,455
					2	%	contir	gencies				70,029
							L Wo			•	•	35,71,484
II. TOOLS AND PLANTS											_	4'27,380
III. ESTABLISHMENT .		•						-		•		14,10,375
								-	•		·	
										TOTA	L.	54,09,239
Allocation.												•
1/2 of above is debitable t	to 4	C. P.	Proje	ets o	n Pai	ri,	Jonk,	Hasad	ano	d Maha	anad	i
rivers	•		•	•	•		•	•	•	•	$\cdot \mathbf{R}$	s. 27,0 <b>4</b> ,620
1/2 of above debitable to projects) rivers .	4 <u>r</u>	projects			Stat	ie 01	a Sab	ari and	Ind	lravati		07.04.690
projecta) rivera .	•	•	•	<u> </u>	<u>.                                    </u>	•	•	•	٠	•	τ.	s. 27,04,620
ALLOTMENT REQUIRED.												
	1	!st year.	. :	2nd ye	ar.	3rd	year.					
	]	l6 lacs	2	0·9 la	CS	181	acs					
						-						
			DET	AILS	,							
		-										
i. works-												
(I) Dam and appurtenant Wor	rks -											
(A) Preliminary expenses.												
(a) Surveys to be carried out	hv	the S		of Ta	مئتہ							
Reservoir surveys.	IJ	orte pr	плей	01 11	iuia.							
Pairi					ţ	<b>7</b> 5 0	a. mil	94				
Jonk	•	•	•	•		78	do.	08.				
Hasado	•		•	•		26	do.					
Mahanadi			•	•		44	do.					
Bhopalapatnam		•				41						
Sabari		•		•		00						
Chitrakot & Barasur						00	do.	(Appro	(.x			
								——————————————————————————————————————	,			_
004 7 0 000	••				c	3 <b>64</b>	do.					Rs.
864 sq. miles @ 375/- per sq. m		•	•	•	•	•	•	•	•	•		3,24,000
(b) Surveys to be carried out by Longitudinal Sections and	oth	ier misc	cellar	7. 1eous :	urve	ys li	ke ca	nal alig	nmer	at surv	eys,	
special reservoir surveys, p 8 sites @ 25,000/- per site	noci(	· emonte									_	2,00,000
						-	•	•	•	•	•	
'(K) Buildings—												<b>5,24,000</b>
Temporary buildings Lump	~											
	p Su	ım	•	•	•	٠	•			•		1,00,000
(II) Main Canals and Branches.— Survey of irrigation area. 13,50,000 acres @ -/9/	_		•	•	•	•	•	•	•	•	•	1,00,000

		7	1								
(III) Discharge observations											
Number of sites—8 (one at e	ach	dam	site)								
Expenditure per site.											
(a) Equipment non-recurring—											Rs.
1 current meter @ 1200/	•		•							•	1,200
1  large boat @ 1000/- .	•			•		•		•	•		1,000
1 small boat @ 500/-	٠				•						500
1 set velocity rods @ 200/	•	•		•			•	•	•	•	200
1 set sounding rods @ 100/-	•	•	•	•	•			•			100
Ropes etc	•	•	•	•	•	•	•	•	•	•	600
Chronometers	•	•	•	•	•	•	•	•	•	•	200
Rack and pinion arrangements	•	•	•	•	•	•	•	•		•	200
Anchors .	•	•	•	•	•	•	•	•	•	•	1,000
											5,000
(b) Recurring.											
1 gauge reader @ 75/- for 3 yea	rs	٠	•	•	•	•	•	•		,700	
1 Boatman @ 60/- for 3 years	•	•	•	•	•	•	•	•		,160	
6 Khalasis @ 50/- for 3 years	•	•	•	•	•	•	•	•	10,	,800	_
									18	5,660	•
		l for		te .		20,660	_	•			-
(IV) Silt observations—	TOL	8 sites	3	•	,	65,280	,				
(i) Equipment non-recurring @	1000	1 202	arto								9.000
(ii) 8 silt observers @ 100/- for		_	8100	•	•	•	•	•	•	•	8,000
(iii) 16 khalasies @ 50/- for 3 ye	-	MD	•	•	•	•	•	•	•	•	28,800 28,800
(iv) Miscellaneous on Carriage &		nsnor	t	•	•	•	•	•	•	•	5,000
(10) Elipopiolio ou contrago d	~ 2.20	шрог	• •	•	•	•	•	•	•	•	
											70,600
(V) Property Surveys-											
2 surveyors @ 100/- p.m. for 3	7700 PC										7 900
12 Khalasies @ 50/- p.m. for 3 y		•	•	•	•	•	•	•	•	•	7,200
12 Interested & 50/- p.m. 101 5 y	Cais	•	•	•	•	•	•	•	•	•	21,600
											28,800
(VI) Meteorological Surveys-											
(a) Equipment non-recurring-											
50 new rain gauges @ 500/- eac	h.				•						25,000
(b) Recurring—											,
2 Meteorological Assistants @ 2	200/- :	for 3	years			•					14,400
2 Senior Observers @ 120/- for	3 уеа	rs									8,640
50 Part-time observers @ 20/- fo	r 3 y	ears									36,000
											94.040
											84,040
(VII) Geological Surveys—											
(a) Equipment non-recurring—											
8 Diamond Drills @ 75,000 each		•	•	•	•	•		•			6,00,000
Diamonds and other spares @ 4				•	•	•	•	•	٠	•	3,20,000
2 Calyx drill 5"-6" complete wit.			nt and	l spar	es	•	•	•	•	•	50,000
8 special boats for drills @ 2000	•		•	٠	•	•	•	•	•	•	16,000
Testing apparatus for rocks and	rock	mate	rial	•	•	•	•	٠	•	•	1,00,000
											10,86,000
(b) Recurring expenditure—		-									
1 Geologist @ 800/- for 2 years		•	•	•	•		•	•	•		19,200
2 Assistants Geologists @ 400/-	for 2	2 year	s .	•	•	•		•			19,200
1 Drill Foreman @ 1000/- for 2			•	•	•	•	•	•	•	•	24,000
8 Operators (1 per drill) @ 150			rs.	•	•	•	•	•	•	•	28,800
48 helpers (6 per drill) @ 80/- for	-		•	•	•	•	•	•	•	•	92,160
Fuel and other expenditure @ 2	20,00	0/- p.1	n. for	20 m	onths		•	•	•	•	4,00,000
											5,83,360
m . 1 c . c . 1 . 1											<del></del>
Total for Geological survey	s	•	•	•	•	•	•	•	•	•	16,69,360
(VIII) Communications											
Lump Sum	•	•	•	•	•	•	•	•		•	1,00,000
TOTAL OF WORKS											'34,11,815
2% Contingencies					•		•	•	•	•	70,236
GRAND TOTAL WORKS .	•			•				•			34,82,055

II. TOOLS AND PLANTS											
(a) Camp equipage											0.400
8 tents 14,× 14' @ 1200/- each	•	٠	•			•	•	•	•	•	9,600 16,000
20 tents $10' \times 10'$ @ $800$ /- each 20 shouldaries @ $600$ /- each.		:	:	•		:		•	•	•	12,000
20 servants tents @ 500/- each	•		•	•				•	•	•	10,000
Camp furniture	•	•	•	•	٠	•	•	•	•	•	4,800
(b) Other tools and plants (i) Non-recurring											<b>52,4</b> 00
15 3/4 ton weapon carrier trucks	@ 70	00/-	each								1,05,000
6 jeeps with trailers @ 7000/- ea						·	·				42,000
8 outboard motors @ 1000/- ea											8,000
32 levelling instruments @ 1000		١.	•								32,000
32 measuring chains @ 50/- each											1,600
32 100 ft. tapes @ 30/- each		•									960
32 50 ft. tapes @ 20/- each.			<b>´</b> .								640
6 Theodolites @ 2000/- each											12,000
10 binoculars @ 300/- each .											3,000
15 drawing boards @ 30/- each					•						<b>4</b> 50
15 plane tables @ 150/- each											2,250
12 Prismatic compass @ 150/- c	ach										1,800
3 Planimeters @ 500/- each											1,500
24 drawing instrument boxes 2nd	l class	@ 2	200/- e	ach							4,800
Scales with offsets, French curve		_									600
•											0.74.400
(ii) Recurring expenditure.											2,16,600
Repairs and carriage of scientific	c mstr	ume	nts for	3 year	ars						37,500
Running expenses for trucks an	d jeep	s for	3 year	cs	•	•	•	<u>-</u> :	•	•	1,12,500
Total (a) and (b) Tools and	Dlone	·a									4,19,000
2% Contingencies .	. FIMIL	AS .	•	••	•	•	•	•	•	•	8,380
	•	•	•	•	•	•	•	•	•	•	
Grand Total Tools and Pla III. ESTABLISHMENT (Provision for 3 years).		•	•	•	•	•	•	•	٠	•	4,27,380
1 Superintending Engineer @ 1		p.m.	•	•	•	•	•	•	•	•	66,600
2 Executive Engineers @ 800/-	_	•	•	•	•	•	•	•	•	•	57,600
4 Asst. Executive Engineers @	-		•	•	•	•	•	•	•	•	86,400
4 Asstt. Engineers @ 500/- p.m	. each	•	•	•	•	•	•	•	•	٠	72,000
1 Superintendent @ 300/- p.m.		•	•	•	•	•	•	•	•	•	9,600
2 Head Clerks @ 200/- p.m. eac		•	•	•	•	•	•	•	٠	•	14,400
2 Accountants @ 200/- p.m. ea		•	•	•	•	•	•	•	•	•	14,400
1 Stenographer @ 200/- p.m. es			•	•	•		•	•	•	٠	<b>7,2</b> 00
13 Upper Division clerks including		_	s. @ 10	ν/- p.	m. e	acn	•	•	•	•	46,800
23 Lower Division clerks @ 75/-		acn	•	•	•	•	•	•	•	•	62,100
2 Steno-typists @ 100/- p.m. es			•	•	•	•	•	•	•	•	7,200
1 Head Draftsman @ 300/- p.r		, h	•	•	•	•	•	•	•	•	9,600
2 Senior Draftsmen @ 100/- p.r 6 Draftsmen @ 100/- p.m. each		ťŢ	•	•	•	•	•	•	•	•	11,520
	1.	•	•	•	•	•	•	•	•	•	21,600
6 Tracers @ 75/- p.m. each	•	•	•	•	•	•	•	•	•	•	16,200
32 Overseers @ 150/- p.m. each 2 Sub-Asstt. Surgeons @ 150/-		· naah	•	•	•	•	•	•	•	•	1,72,800
4 Research Asstts. @ 180/- p.n			•	•	•	•	•	•	•	•	9,600
4 Silt Analysts @ 180/- p.m. es			-	•	•	•	•	•	•	•	25,920 14,400
4 Laboratory Asstts. @ 125/- p	.m. ea	ich	:	:	:	•	:	:	•	:	18,000
2 Compounders @ 75/- p.m. ea	ch.	٠	•	•	•	•	•	•	•	•	4,800
2 ward boys @ 50/- p.m. each 1 Jemadar @ 40/- p.m.	•	•	•	•	•	•	•	•	•	•	3,600 1,440
21 peons @ $30/$ - p.m. each .	•	•	•	•	•	•	.•		•		22,680
44 Barkandaz @ 30/- p.m. each 10 Daffadars @ 30/- p.m. each	•	•	•	•	٠	•	•	•	•	•	47,520
1 Daftri @ 40/- p.m		•	:	•	•	•	•	•	•	•	10,800 1,440
<b>V</b> . <b>L</b>											8,40,300
Dearness allowance @ 25%											
Travelling allowance @ 25%  Establishment contingencies in	cludin	· g offi	ice for	njtur	e. trer	Deparit	ers etc	•	•	:	2,10,075 1,80,000
		. viii	141	.aacveeli'		POTAL			IMENT	•	14,10,375
										•	

## APPENDIX VIII ASSAM PROJECTS REPORT

Assam, the eastern most Province of India, covers an area of 63,000 square miles and gets an annual precipitation of 286 million acre feet. It has tremendous water power potential and a vast scope for industrialisation from its mineral and forest wealths. It suffered a strategic strain during the last war and with partition has become still

more important and therefore needs an industrial development allround.

The Province can roughly be divided into 2 .nain valleys, the Brahmaputra valley in the north and the Surma valley in the south. The waters of these rivers at present cause devastating floods, destroying crops, water logging lands and creating problems of soil erosion and denudation. At the instance of the Government of Assam, the Central Waterpower, Irrigation and Navigation Commission undertook a preliminary survey for multipurpose schemes to solve the above problems as well as to provide cheap power for industrialisation. The available data which is very meagre showed that 12 schemes, 3 in the Surma valley and 9 in the Brahmaputra valley could be mooted. Of these 4 schemes on the Barak and Someshwari rivers in the Surma valley and Dihang and Manas rivers in the Brahmaputra valley were entrusted for investigation to the Central Waterpower, Irrigation and Navigation Commission at a conference held by His Excellency the Governor of Assam in October, 1947.

The Central Waterpower, Irrigation and Navigation Commission started investigations on these four schemes in January, 1948, and two of the rivers Dihang and Barak have been inspected by an Engineer, Dihang having been inspected by a Geologist also.

The inspection has shown that schemes on both the rivers are promising.

The four schemes are briefly described below in order of priority and their principal features are shown in the accompanying statement.

- 1. Dihang.—It is the main tributary of the Brahmaputra and possesses 2 excellent storage sites within 13 miles of its debouch from the hills. A 500 feet dam will impound lake of 9.82 million acre feet and generate at least one million k. w. of continuous power. The scheme will provide for flood absorption by storing the supply of the main tributary at times of rain thereby releasing the capacity of Brahmaputra in the lower basin to absorb floods from other tributarias. The lake will be 70 miles long and help in opening up the tribal areas of Assam.
- 2. Barak.—Barak rises in the hills of Manipur State, bifurcates into two estuaries the Surma and the Kusiyra, which both fall into the Meghna river. When Meghna is in floods, its back water effect interrupts drainage of the Surma Valley with the result that the plains of Catcher and sylhet districts become almost the sheet of water. A storage scheme on this river would ab orb floods thereby reclaiming the plains of Surma Valley from water-logging and will provide irrigation to the reclaimed areas as also generate about 2,90,000 two of power, which can be used in industrial exploitation of the tremendous fores, wealth of Manipur and Lushai hills. As these hills are of shalys formations, 3 alternate schemes as shown in the statement have to be investigated.
- 3. Manas.—Manas is the largest tributary of the Brahmaputra at the western end of Assam. The river is snow cum rain fed and large icebergs are reported now and again to form artificial dams in the river and cause unexpected floods when any one of them gives way. A 400 feet high dam will solve this flood problem, generate 2,50,000 k. w. of continuous power and provide irrigation to the western are sof Assam. The Government of India have under consideration a project for a navigation canal between Ganges, Tista and Brahmaputra to provide water transport between Assam and West Bengal. The Manas project will shorten one of the links in the development of this canal as it will make Manas in wigable throughout the year and the canal can be connected with Brahmaputra through Manas.

4. Someshwari.—Someshwari river provides a site for power generation at the southern fringe of Gharo hills. The river has a catchment area of 803 square miles and a 340 ft. high dam will store the entire run off. There are rich coal fields and purest limestone quarries near this site and the power generated is expected to help in the

development of these industries.

To enable these 4 schemes to be put through, detailed investigations covering copographical surveys of reservoir areas, surveys for irrigation, hydrological surveys, meteorological observations, ceological surveys, navigational surveys, soil conservation surveys and pisciculture surveys have to be undertaken. It is proposed to open up a Circle with 3 Divisions and 9 sub-divisions to carry out these investigations and complete them in a period of 3 years. Besides the civil staff, the geological staff and the meteorological staff have been provided and the total estimate for the investigations amounts to Rs. 50,00,000.

5. Index map showing dam sites etc. is enlcosed.

K. M. BHATIA,

Project Officer
C.W.I.N.C.—3.5. 1948.

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o k	S. No. Name of Tribu- Name of near- tary est village	Name of nearest village	Longrbude and Latifude of left bank of dam site	Appro Map in ate or which dam ment and water in sq. spread fall	xim- stch- area miles	Maximum Ap water Le- heag vel F. ove	Approx. Approx. E. T. L. we over river resided in M feet a	of of it.	Submerged Approx. area in length o acres dam in fe	# #2	Capacity 4 in m.a.f. raii 11 (	tverage 1-fall for j years Inches)	Run off as P per Inglis ti formula (at 50 %) Mil- lion acres ff.	Power potential Q. H.
	. 67	ത	. 4t	, re	9	<b>L-</b>	∞ ∞	site in miles 9	10	11	12	13	14	, t4
-	1 Dihang.	Rengging.	96°-14′-30″ E				ij					G E		1
¢./	2 Menes	Matharguri	28°-11′-30″ N 90°-56′-30″ E	82/P. L.	89,600	1,000	470	89	00,000	1900	9.85	170.43	54.18	54.18
	j		26°-48′-30″ N	78/J. M. N.	11,300	1,000	400	34	64,700	1900	10.67	105.73	46.94 2	240000 k.w
9	Somesnwaru	masignav.	25°-13'30" N	ा १८/५०। स	800	400	330	59	33,200	2000	4.75	125.14		65000 k.w.
$\overline{}$	4(I) Barak	Sibapurikhal	93°-3′ E	83H/N. W.										
				N.E.S.W.S.E.	4,800	200	440	129	89,600	4000	16.00	82.10	17.9 29	290000 k.w.
	4(LL) Barak.	Bhubandhar.	93°-12'-30' E 24°-41'-0" N	83.H/IN.W.D.W.	5,270	400	340	108	94,000	4000	15.15	82.10		225000 k.w.
7	4(III)A Barak.	Bhubandhar,	93°-6'-0" E	83/N.W.S.W.										
			24°-41′-0″		5,270	300	240	88	58,300	4000	7.19	82.10		116000 k.w
1	4(III)B Ahu	Tingmum	93°-6′-0″ E	83H/N. W.			<del>j</del> dn	upto upper I	Dam				֓֞֞֞֞֟֝֟֟֝֟֟֝֟֝֟֟֓֟֝֟֟֓֟֝֓֟֓֟֟֓֓֓֓֟֟֓֓֓֟֟֓֓֓֟֓֟֓֟֓֟֓֟֓֟֓֟֓֟֓	
			24°-41′-30″ N		1,475	450	250	31	6,700	2000	0.74	82.10	5.44	21000 kw.
≍	4(III)C Irang & Tinjang Gallon.	Gallon.	93°-15′-0″ E	83H/S. W.									5.22	
			24°-30′-30″ N	N. W.	1,440	450	260	88	7,000	2000	0.93	89 10	3.16	21000 k.w.

*Inglis formula is given as R"-.0.85P"-12"

overall estimate for preliminary surveys and investigations for four projects in Assam.

### ABSTRACT

	Pe	riod	of inv	restiga	tion	•	•		3 years.
Detailed estimate as prepared and submitte	ed to	w. 1	4. P. 1	for 15	mont	hs ope	ration	ıs—	
(Establishment provided for 12 to 14 mo Deduct non-recurring cost	nths)	•	:	:	:	:	•	•	23.08 lacs. 10.3 lacs.
									12.78 lacs.
Assume 3 times this cost for 3 years operation	ns		•			•			38.4 lacs.
Add non-recurring cost	•	•	•	•	•		•	•	10.3 lacs.
,					_	otal ay .	:		48.7 lacs. 50 lacs.

(Sd.) K. M. Bhatia-3-5-1948

Project Officer. C. W. I. N. C.

Rough estimates of preliminary investigations of the Assam Projects for the years 1947-48 and 1948-49.

				ABST	rRAO	T			1947-48 Rs.	1948-49 Rs.
1. Surveys by Survey of India	Depar	tment						•	10,000	4,00,000
2. Surveys by C. W. I. N. C.						•			5,000	1,10,000
3. Discharge observations (4 s	ites)							•	2,500	30,000
4. Silt Observations								•	2,000	23,000
5. Property surveys									Nil	10,000
6. Meteorological Surveys .								•	• •	40,000
7. Seismological Surveys .							•	•	• •	20,000
8. Geological investigations								•	• •	8,00,000
9. Communications						•			• •	25,000
10. Temporary buildings .								•	• •	25,000
11. Camp equipage									20,000	10,000
12. Tools and Plants			•						1,00,000	80,000
13. Establishment									40,000	2,40,000
14. Dearness allowance .						•			16,000	96,000 .
15. Travelling allowance .				•					12,000	72,000
16. Office contingencies	•		•	•	•	•		•	60,000	60,000
		To	tal		,	•	•		2,67,500	20,41,000

NEW DELHI;

MAN SINGH,

18-11-47.

Director of Waterways, C. W. I. N. O.

DETAILS	Rs.	Rs.
I. Surveys to be carried by Survey of India Department under direction of the C. W. I. N. C.—	•	
(a) Gorge sites 25 sq. miles @ 110/. per sq. mile	2,750	
River survey 1,000 sq. mile @ Rs. 44/- per sq.m	44,000	430
Moving aircraft, etc	3,250	• •
(b) Surveys and map publications.—		
Gorge sites 5,000 acres @ 4/- per acre	20,000	4 m
River Survey 900 sq. miles @ 160/- per sq. mile	1,44,000	••
	1,64,000	• •
(c) Contoured surveys of Assam projects flood plain in Assam for Irrigation and other protective measures, 3,48,000 acres @ -/9/- per acre	1,96,000	4,10,000
II. Survey to be carried out by or under direction of the C. W. I. N. C.—		
(a) Longitudinal Sections of rivers and cross sections, 650 miles @ 150/- per mile	97,500	• •
(b) Other miscellaneous surveys e.g. canal alignment, special reservoir surveys, etc.	17,500	1,15,000

III. Discharge observations.—		
Number of sites 4		
Expenditure per site. Equipment Non-recurring.—		
1 current meter @ 1,200/	1,200	
1 boat large @ 1,000/	1,000	
1 boat small @ 500/	500	
Velocity rods	200	
Sounding rods	100	
Ropes, etc.	600	
Chronometers	200	
	3,800	
Recurring expenditure.— Provision is made for 12 months.—		
I supervisor @ 150/- p. m	1,800	
l Boatman @ 40/- p. m	480 1,440	
T. A., etc	605	
	4,325	
4 Sites equipment @ 3,800 per site	15,200	
4 Sites recurring expenditure @ 4,325/- per site	17,300	32,500
One silt observer and one analyst are proposed to be employed for tak-	•	
ing observations at each site.		
(1) Equipment non-recurring	4.000	
Apparatus. 4 sets	4,000	4,000
(ii) Recurring expenditure.—  Provision is made for 12 months.		
4 silt observers @ 100/- p. m. each	4,800	
4 silt analysts @ 100/- p. m. each	4,800	
Khalasis (4 per observer and 2 per analysts) 24 @ 30/- p, m, each	8,640	
Dearness and Travelling allowance	2,760	21,000
V. Property Surveys.—	2,.00	21,000
1 Supervisor for 12 months @ 110/- p. m.	1,320	
4 Surveyors for 12 months @ 80/- p. m	3,800	
12 Khalasis for 12 months @ 30/- p. m.	4,320	
Patwaris Lump Sum	560	
VI. Meteorological Surveys. (Rain gauges and Snow courses). It is pro-		
posed to install 50 new gauge stations.		
(i) Equipment installation of gauges non-recurring.—		
50 rain gauges (including temperature, 25,000 humidity and wind velocity at 25 places, also some self recording gauges) average rate	i e	
of say 500/- each	25,000	
Miscellaneous apparatus snow samples etc	4,000	29,000
(ii) Recurring expenditure.—		
Provision is made for 12 months.		
I. Meteorological Assistant @ 200/	2,400	
1 Senior observer @ 120/- p. m	1,440	
16 Observers (part time) @ 15/- p. m	2,880	
16 Retainers (part time) @ 12/- p. m	1,536	
2 snow surveyors @ 120/- p. m	2,880	Say 40,000
	40,136	Say 40,000
VII. Seismological Surveys.		
This will be taken up separately in consultation with the Director o Meteorological Surveys but a lump sum provision is made of Rs. 2	f	
VIII. Geological Investigations.—	0,000/	
(i) Equipment non-recurring.—		
4 Diamond Drill with equipment complete @ 75,000/- each	3,00,000	
Diamonds (and other spares) for the above @ 40,000/- each	1,60,000	
1 Calyx Drill 5"—6" complete with equipment, etc.	20,000	
Spare for above	5,000	
4 special boats for drills @ 2,000/- each	. 8,000	
Testing apparatus for rocks and rock materials	47,000	5,40,000
(ii) Recurring expenditure.—	,000	2,20,000
1 Geologist @ 600/- p. m. for 15 months	9,000	
, 2, Asstt, Geologists @ 300/- each for 15 months	9,000	
l Drill Foreman @ 1,000/- p. m. for 12 months	12,000	
4 Operators (1 per drill) @ 140/- p. m. each for 12 months	. 6,720	
24 helpers (6 per drill) @ 80/- p. m. for 12 months.	23,040	
Running expenses of 4 engines for drills for 10 months.@ 5,000/- per	20,020	
drill	2,00,000	any 2,60,000

		1	4					
IX. Communications—								
Lump Sum							25,000	5,000
. Temporary buildings.—							97 000	95 (00
Lump Sum	•	•			•		25,000	25, 00
4 tents 14' × 14' @ 1,200/- each	'n.	_				_	4,800	
12 tents 10' × 10' @ 800/- each	•	•	•	•	•	•	9,600	
12 shouldaries @ 600/- each .	•	•	•	•	•	•	7,200	
12 servants tents @ 500/- each	•	•	•	•	•	•	6,000	
Camp furniture	•	•	•	•	•	•	2,000	29,600
XII. Tools and plants—	•	•	•	•	•	•	2,000	20,000
(i) Non-recurring—								
13 trucks @ 7,000/- each							91,000	
4 jeeps @ 7,000/- each	•	•	•	•	•	•	28,000	
4 country boats @ 1,000/- each	•	•	•	•	•	•	4,000	
4 outboard motors @ 1,000/- each		•	•	•	•	•	4,000	
8 Chronographs @ 100/- each .		•	•	•	•	•	800	
24 levelling instruments @ 1,000/- es	nch	•	•	•	•	•	24,000	
Measuring chains 24 @ 15/- each		·	·	•	·	•	360	
26—100' tapes @ 30/- each .	•	·	•	•	•	·	780	
30-50' tapes @ 20/- each	•	•	•	•	•	•	600	
4 Theodolities @ 1,200 /- each .	•	•	•	•	•		4,800	
6 Binoculars @ 200/- each	•	•	•	•	•	-	1,700	
12 drawing instrument boxes 2nd cla		00/- a	ech	•	•	•	2,400	
Scales with offsets, French curves .	100 W 11	00 ₁ - 0	COLA	•	•	•	500	
12 Drawing Boards @ 30 each .	•	•	•	•	•	•	360	
12 Drawing Boards @ 30 each .	•	•	•	•	•	٠_		
(1) To							1,64,000	
(ii) Recurring expenditure.—  Repairs		_					4,000	
Working of trucks	•	:	:	:	Ċ	:	12,000	
XIII. Establishment—								
(Provision is made for 14 months).								
3 Executive Engineers @ 600/- p.	m each						25,000	
9 Assistant Engineers (S. D. Os.) @			each	•	•		44,100	
1 Superintendent @ 250/- p. m.	, 000/- <u>1</u>	y	Caroli	•	•	•	3,500	
3 Head Clerks @ 160/- p. m. each	•	•	•	•	•	•	6,720	
1 Stenographer @ 160/- p. m.	•	•	•	•	•	•	2,240	
3 Accountants @ 150 p. m. each	•	•	•	•	•	•	6,300	
	oo oh	•	•	•	•	•	3,360	
3 Upper grade clerks @ 80/- p. m.		•	•	•	•	•	3,360	
3 Accounts clerks @ 80/- p. m. eac 9 Sub-divisional clerks @ 80 p. m.		•	•	•	•	•	10,080	
9 1	, each	•	•	•		•	3,360	
3 Steno-typists @ 80/- p. m. each	nach	•	•		•	•	3,080	
4 Lower grade clerks @ 55/- p. m.		•	•	•	•	•	2,310	
3 Record Keepers @ 55/- p. m. eac		· ·	•	•	•	•	4,620	
6 Assistant Accounts Clerks @ 55/-	-		4000	•	•	•	6,930	
9 Assistant Sub-divisional clerks @			Bach	•	•	•	2,310	
3 Assistant Record keepers @ 55/-		acn	•	•	•	•	2,310	
2 typists @ 55/- p. m. each	•	•	•	•	•	•	2,310 2,310	
3 despatchers @ 55/- p. m. each	•	•	•	•	•	•	4,200	
I Head draftsman @ 300/- p. m		•	•	•	•	•		
3 Senior draftsmen @ 1707- p. m.		•	•	•	•	•	7,140 11,200	
8 draftsmen @ 100/- each		•	•	•	•	•	4,200	
3 Overseers (Headquarters) @ 100		eacn	•	•	•	•	· · · · · · · · · · · · · · · · · · ·	
0 , 1	•	•	•	•	٠	•	6,720	
36 Overseers @ 100/- p. m. each .		•	•	•	•	•	50,400	
6 Research Assistants @ 160/- p. r		•	•	•	•	•	13,440	
5 Silt Analysts @ 100/- p. m. each			•	•	•	•	7,000	
3 Sub-Assistant Surgeons @ 100/-		acn	•	•	•	•	4,200	
3 Compounders @ 40/- p. m. each		•	•	•	•	•	1,680	
3 Ward boys @ 30/- p. m. each	•	•	•	•	•	•	1,260 · 490	
1 Jemadar @ 35/- p. m. each	•	•	•	٠.	•	•		
27 Peons @ 30/- p. m. each		٠	•	•	•	•	11,340	
12 Dafadars @ 30/- p. m. each	•	•	•	•	•	•	5,040	
24 Barkandaz @ 30/- p. m. each		•	•	•	•	•	10,080	2,79,930
1 Daftri @ 35/- p. m		•	•	•	•	•	490 say	2,79,930 2,80,000
(b) Dearness and Travelling allowance	es.—						•	
Lump Sum		•	•	•	•	•	1,96,000	1,96,000
XIV. Contingencies—					•		1,20,000	1,20,000
Lump Sum	•	•	•	•	•	• -	1,20,000	

Estimate for preliminary surveys and investigations in connection with the projects in Assam Province prepared in accordance with the instructions of the AD-HOC Committee.

		-									
		2	4 <i>BS</i> 2	TRAC	CT					-	•
1. Surveys by Survey of India				_		_					6,16,500
2. Surveys by C. W. I. N. C.	·	·	•				·				1,50,000
3. Discharge observations .	•	•	•	·	•		•				57,760
4. Silt Observations		•					•		•	•	26,000
5. Property Survey	·	·								•	9,600
6. Meteorological Survey											60,800
7. Seismological Survey .											25,000
8. Geological Survey			•			` .					8,53,280
9. Communications Lump Sum											50,000
10. Buildings Lump Sum .						•					50,000
11. Camp equipage	·		·		·		Ĺ			·	29,600
12. Tools and Plants	·	•					•				2,80,170
13. Establishment	•	•	•	·		•	•	•			8,65,000
	•	•	•	•	m.	1	•	•	•	`-	
		-			1.0	tal	•	•	•	*	30,73,710
			DE'	TAII	LS						
I. Surveys to be carried out by Surv	ey of	India-									
<ul> <li>i) Air photography of gorge sites</li> <li>(ii) River survey. 5 mile strip for Brahmaputra. 202×5 = 1,0</li> </ul>	r leng						-	_		with	5,000
Say 1,000 sq. mile @ Rs. 44		sq. m	ıle								44,000
(iii) Moving aircraft	-								•		5,000
										•	•
(b) Field Surveys and Publications											
(i) Reservoir sites 200 sq. mile	-	-		mue .	•	•	•	•	•	٠	75,000
(ii) River area 1,000 sq. mile @	-	-		•		•	•	•	•	•	3,75,00 0
(iii) Irrigation potential on Man	as 2,0	0,000	acres	@ -/9/	- per	acre	•	•	•	•	1,12,500
	•									_	6,16,5000
II. Survey to be carried out by C. W	. <i>I</i> . A	7. <b>C.</b>	-								
(a) Longitudinal sections of rivers	200 n	iles @	150	per mi	le	•					30,000
(b) Other miscellaneous surveys lik	e can	al alig	nment	t, spec	ial res	ervoi	r, pisc	icultu	re, e	tc.	1,20,000
				•			•			-	1 50 000
										_	1,50,000
III. Discharge Observations —											
Number of sites 4 (2 for projects ar wari).	ad 2 r	nore fo	or hyd	lrologi	cal da	ta fo	r Bara	ak and	l Som	esh-	
(a) Equipment expenditure non-rece	urring	·~_ (									
I Current meter @ 1,200 .							•				1,200
1 Boat large @ 1,000	•			•	•	•		•	•	•	1,000
I Boat small @ 500		•	•			•		•	•	•	500
1 Set sounding rods @ 100.	•	•	•	•	•	•	•	•	•	•	100
Ropes, etc	•	•	•	•	•	•	•	•	•	•	600
Chronometers	•	•	•	•	•	•	•	•	•	•	
Rack and Pinion arrangement	•	•	•	•	•	•	•	•	•	•	200
Theor and Thibu ansubattant	•	•	•	•	•	•	•	•	•	* _	200
											4,000
										-	

(b) Ragamain =											
(b) Recurring—											
1 Gauge reader @ 75 for 2 years	•	•	•	•	•	•	•	•	•	•	1,800
1 boatman @ 60 for 2 years 6 Khalasis @ 50 for 2 years	•	•	•	•	•	•	•	•	•	•	1,449
o ixilalasis @ 50 for 2 years	•	•	•	•	•	•	•	•	•	٠ ـ	7,200
											10,440
			Tot	al fe	or one	site					14,440
		•					Ť	•	•	·	, i
			Tot	al i	or 4 s	ites	•	•	٠	_	57,760
IV. Silt Observations —											
(i) Equipment non-recurring @ 1,	.000/-	per sit	е.								4,000
(ii) 4 Silt observers and Analysts		_		ars	•	•				· ·	9,600
(iii) 8 Khalasis @ 50/- for 2 years	_								•		9,600
(iv) Miscellaneous on carriage and	l Trar	sport		•			•		•	•	2,800
											26,000
										-	
											•
V. Property Survey-											
1 Surveyor @ 100/- for 2 years											2,400
6 Khalasis @ 50/- for 2 years	•				·	•	•	•	•		7,200
						•		•	·	•	
•											9,600
VI. Meteorological survey (rain gauge	e and	enom c	mee	۰۱							
						- 00				•-	
(i) 50 more rain gauges as proposed gauge for 4000 sq. miles @ 500/-	LUODE	o maca.	nea (	m D	arak o	r Som	aswar	1) givi	ng or	re	25,000
Snow survey appratus .	•	•		•	•	•	•	•	•	•	7,500
(ii) Recurring expenditure—	•		•	•	•	•	•	•	•	•	•,000
1 Meteorological Assistant @ 200	)/- for	2 year	rs								4,800
1 Senior observer @ 120/- for 2 y		•						•			2,880
16 Observers @ 20/- for 2 years (	(part-	time)						•			7,680
16 Retainers (part time) @ 15/- i			•	•	•	•	•	•	•	•	5,760
2 Snow surveyors @ 150/- for 2	year	•	•	٠	•	•	•	•	•	•	7,200
										•	60,820
VII. Seismological Survey—											
Lump Sum	•		•		• •	•	•	•	•	•	25,000
VIII. Geological Survey—										,	
						•					
(i) Equipment non-recurring — 4 Diamond Drills @ 75,000/- ea	aah										3,00,000
Diamonds and other spares @		•	•								
		∩/⊸ ner	set	•	٠	•	•	•	•	•	
1 Calvx drill 5"6" complete v				nd sr	eares	•	•	•	•	•	1,60,000
1 Calyx drill 5"—6" complete v 4 Special boats for drills @ 2,0	vith e	quipm		nd sp	ares	•	•	•	•	•	1,60,000 25,000
1 Calyx drill 5"—6" complete v 4 Special boats for drills @ 2,0 Testing apparatus for rocks an	vith e	quipm each	ent ar •	nd sp	eres	•	•	•	•	• • •	1,60,000
4 Special boats for drills @ 2,0	vith e	quipm each	ent ar •	nd sp	oares	•	· · ·	· · ·	•	•	1,60,000 25,000 8,000 47,000
4 Special boats for drills @ 2,0	vith e	quipm each	ent ar •	nd sp	oares ·	•		•	•	•	1,60,000 25,000 8,000
4 Special boats for drills @ 2,0 Testing apparatus for rocks an	vith e	quipm each	ent ar •	d sp	oares ·	•		•	•	•	1,60,000 25,000 8,000 47,000
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—	vith e 000/- e d rocl	quipm each	ent ar •	id sp	oares	•	•	•	•		1,60,000 25,000 8,000 47,000 5,40,000
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 years	vith e 000/- e d rock	quipmo each k mate	ent ar •	ind sp	oares		•				1,60,000 25,000 8,000 47,000 5,40,000
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 years 1 Asstt. Geologist @ 400/- for	vith e 000/- e d rock s .	quipmo each k mate	ent ar •	ind sp	oares						1,60,000 25,000 8,000 47,000 5,40,000
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 year  1 Asstt. Geologist @ 400/- for  1 Drill Foreman @ 1,000/- for	vith e 000/- e d rock s . 2 yes 2 yes	quipmo each k mate k mate	ent ar	nd sp	oares						1,60,000 25,000 8,000 47,000 5,40,000 19,200 9,600 24,000
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 year: 1 Asstt. Geologist @ 400/- for 1 Drill Foreman @ 1,000/- for 4 Operators (1 per drill) @ 150	vith e 000/- e d rock s . 2 yes 2 yes 0/- for	quipmo each k mate k mate	ent ar crial	and sp	oares						1,60,000 25,000 8,000 47,000 5,40,000 19,200 9,600 24,000 14,400
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 year: 1 Asstt. Geologist @ 400/- for 1 Drill Foreman @ 1,000/- for 4 Operators (1 per drill) @ 150 24 Helpers (6 per drill) at 80/-	s. 2 yes 2 yes 0/- for	quipmo each k mate ars ars 2 yea	ent ar crial cris crs								1,60,000 25,000 8,000 47,000 5,40,000 19,200 9,600 24,000
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 year: 1 Asstt. Geologist @ 400/- for 1 Drill Foreman @ 1,000/- for 4 Operators (1 per drill) @ 150	s. 2 yes 2 yes 0/- for	quipmo each k mate ars ars 2 yea	ent ar crial cris crs								1,60,000 25,000 8,000 47,000  5,40,000  19,200 9,600 24,000 14,400 446,080 2,00,000
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 year: 1 Asstt. Geologist @ 400/- for 1 Drill Foreman @ 1,000/- for 4 Operators (1 per drill) @ 150 24 Helpers (6 per drill) at 80/-	s. 2 yes 2 yes 0/- for	quipmo each k mate ars ars 2 yea	ent ar	m. p				·			1,60,000 25,000 8,000 47,000 5,40,000 19,200 9,600 24,000 14,400 46,080 2,00,000
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 year: 1 Asstt. Geologist @ 400/- for 1 Drill Foreman @ 1,000/- for 4 Operators (1 per drill) @ 150 24 Helpers (6 per drill) at 80/-	s. 2 yes 2 yes 0/- for	quipmo each k mate ars ars 2 yea	ent ar				· · · · · · · · · · · · · · · · · · ·	·			1,60,000 25,000 8,000 47,000  5,40,000  19,200 9,600 24,000 14,400 446,080 2,00,000
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 year: 1 Asstt. Geologist @ 400/- for 1 Drill Foreman @ 1,000/- for 4 Operators (1 per drill) @ 150 24 Helpers (6 per drill) at 80/-	s. 2 yes 2 yes 0/- for	quipmo each k mate ars ars 2 yea	ent ar	m. p				ths			1,60,000 25,000 8,000 47,000 5,40,000 19,200 9,600 24,000 14,400 46,080 2,00,000 3,13,280
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 year: 1 Asstt. Geologist @ 400/- for 1 Drill Foreman @ 1,000/- for 4 Operators (1 per drill) @ 150 24 Helpers (6 per drill) at 80/-	s. 2 yes 2 yes 0/- for	quipmo each k mate ars ars 2 yea	ent ar	m. p				aths			1,60,000 25,000 8,000 47,000 5,40,000 19,200 9,600 24,000 14,400 46,080 2,00,000 3,13,280
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 year  1 Asstt. Geologist @ 400/- for  1 Drill Foreman @ 1,000/- for  4 Operators (1 per drill) @ 150  24 Helpers (6 per drill) at 80/- Fuel and other running expen	s. 2 yes 2 yes 0/- for	quipmo each k mate ars ars 2 yea	ent ar	m. p				aths			1,60,000 25,000 8,000 47,000 5,40,000 19,200 9,600 24,000 14,400 46,080 2,00,000
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 year: 1 Asstt. Geologist @ 400/- for 1 Drill Foreman @ 1,000/- for 4 Operators (1 per drill) @ 150 24 Helpers (6 per drill) at 80/- Fuel and other running expenditure—	s. 2 yes 2 yes 0/- for	quipmo each k mate ars ars 2 yea	ent ar	m. p				aths			1,60,000 25,000 8,000 47,000  5,40,000  19,200 9,600 24,000 14,400 46,080 2,00,000 3,13,280 8,53,280
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 year: 1 Asstt. Geologist @ 400/- for 1 Drill Foreman @ 1,000/- for 4 Operators (1 per drill) @ 150 24 Helpers (6 per drill) at 80/- Fuel and other running expenditure—	s. 2 yes 2 yes 0/- for	quipmo each k mate ars ars 2 yea	ent ar	m. p				aths			1,60,000 25,000 8,000 47,000  5,40,000  19,200 9,600 24,000 14,400 46,080 2,00,000 3,13,280 8,53,280
4 Special boats for drills @ 2,0 Testing apparatus for rocks an  (ii) Recurring expenditure—  1 Geologist @ 800/- for 2 years 1 Asstt. Geologist @ 400/- for 1 Drill Foreman @ 1,000/- for 4 Operators (1 per drill) @ 15 24 Helpers (6 per drill) at 80/- Fuel and other running expenditure—  IX. Communications—  Lump sum	s. 2 yes 2 yes 0/- for	quipmo each k mate ars ars 2 yea	ent ar	m. p				aths			1,60,000 25,000 8,000 47,000  5,40,000  19,200 9,600 24,000 14,400 46,080 2,00,000 3,13,280 8,53,280

VT Comment				•							
XI. Camp equipage—											4.00.0
4 tents $14' \times 14'$ @ $1,200$ /- each 12 tents $10' \times 10'$ @ $800$ /- each	•	•	•	•	•	•	•	•	•	•	4,80 <i>0</i> 9,600
12 shouldaries @ $600$ /- each .		:	:		:	:	• :	:	:	:	7,200
12 servants tents @ 500/- each Camp furniture	•	•	•	•	•	•	•	•	•	•	6,000
camp furniture	•	•	•	•	•	•	•	•	•	•	2,000
											29,600
XII. Tools and Plants-											
(i) Non-recurring.											
13 trucks @ 7,000/- each .											91,000
4 jeeps @ 7,000/- each .	•	•	•	•	•	•	•	•	•	•	28,000
4 out board motors @ 2,000/-	· eech	•	•	•	•	•	•	•	•	•	8,000
24 levelling instruments @ 1,000			•	•	•	•	•	•	•	•	
24 measuring chains @ 15/- eac	•	rc11	•	•	•	•	•	•	•	•	24,000
24 metallic tapes @ 30/- each		•	•	•	•	•	•	•	•	•	360 700
		•	•	•	•	•	•	•	•	•	720
4 Theodolites @ 2,000/- each	•	•	•	•	•	•	•	•	•	•	8,000
8 Binoculars @ 300/- each		•	•	•	•	•	•	•	•	•	2,400
18 Drawing boards @ 30/- each		•	•	•	•	•	•	•	•		540
18 drawing instruments 2nd size	_	200/-	eacn	•	•	•	•	•	•	•	3,600
3 planimeters @ 500/- each	•	•	•	•	•	•	•	•	•	•	1,500
15 plane tables @ 150/- each	•		•	•	•	•	٠	•	•	•	2,250
12 nos. Prismatic compass @ 15	•		•.	•	•		•	•	•	•	1,800
Other miscellaneous drawing app	aratu	s like	set s	quare	s, sca	les, cu	rves	•	•	•	8,000
											1,80,170
(ii) Recurring expenditure—											
Repairs and carriage of scientific					ars	•	•				25,000
Running expenses for trucks and	ı jeep	s tor :	z yea	rs	•	•	•	•	•	•	75,000
											1,00,000
VIII Establishment								T	otal	•	2,80,170
XIII. Establishment— Provision for 24 months—											
1 Superintending Engineer @ 1,	850/- :	for 24	mon	ths	_	_			_		44,400
2 Executive Engineers @ 800/-	•				·						38,400
6 Assistant Engineers @ 400/- p							·		·		57,600
1 Superintendent for Circle Office					•	•	•	•	•	•	7,200
1 Head Draftsman for Circle Off			-		•	•	•	•	•	•	7,200
1 Stenographer for Circle Office	_		-	•			•	•	•	•	4,800
2 Head Clerks for Executive En							h	•	•	•	9,600
2 Accountants for Executive En				_				•	•	•	9,600
13 upper grade clerks including 8	-		-					•	•	•	31,200
2 Stenographers to Executive En					-	•		•	•	•	
	-	_	•	-				o o b	•	•	4,800
23 lower grade clerks including re 6 Draftsmen @ 100/- p. m. eac		ceper	s autu	vypis	us (G	15/- p.	111. 6	acii	•	•	41,400
6 Tracers @ 75/- p. m. each	,11	•	•	•	•	•	•	•	•	•	14,400
24 Overseers @ 150/- p. m. each	•	•	•	•	•	•	•	•	•	•	10,800
4 Research Assistants @ 200/- p		ooh	•	•	•	•	•	•	•	•	86,400
			•	•	•	•	•	•	•	•	19,200
4 Laboratory Assistants @ 75/- 2 Sub-Assistant Surgeons @ 150	_			•	•	•	•	•	•	•	7,200
3 compounders @ 50/- p. m. eac		ш. өа	cm.	•	:	:	:	•	:	•	7,200 3,600
2 ward boys @ 50/- p. m. each				•		•		•			2,400
1 Steno to Geologist @ 100/- p.											2,400
1 clerk to Geologist @ 75/- p. m 3 daftaris @ 40/- p. m. each	١.	•	•	•	•	•	•	•	•	•	1,800
1 Jemadar to S. E. @ 40/- p. m.	•	•	•	•	•	•	•	•	•		2,880 960
21 peons (8 per Division = 16)	٦	•		•	•	·	•	•	•	•	000
Circle Office—3 Geologist and Assistant—2	} @	<b>3</b> 0/	- p. :	m. ea	ch	•	•	•	•	•	15,120
36 Barkandazes @ 30/- p. m.	each		_	_	_	_	_		_	_	25,920
10 dafadars @ 30/- p. m. each		•	-	-	• •	•	•	•	•	•	7,200
10 databas @ 50, p. 21 5051	•	•	•	•	•	•	•	•	•	• _	
									<b>α</b> -		4,71,360
									Say	٠	4,72,000
Dearness allowance @ 25%											1,18,000
Travelling allowance. Establishment contingencies inc			· .	nit	m		•		•	•	1,50,000
Descriptificate containgencies inc	raame	e ome	e iun	monte	, тур	ewrite:	ıs, et	· ·	•		1,25,000
			To	tal E	stabl	ishmer	t.				8,65,000
								, (8)	3 \ 72	7 T	TT A MT A

(Sd.) K. M. BHATIA,
Project Officer, C. W. I. N. C.
3-5-1948.

### APPENDIX IX

## COORG PROJECT

### REPORT

The province of Coorg is a small centrally administered area in South India, west of Mysore State. The total area is 1,582 square miles and population of less than 2,00,000. It receives an annual rainfall of about 125". A number of schemes for irrigation and hydro-electric generation were projected by the provincial engineers in the past, but all of them were shelved for one reason or another. A small province like Coorg cannot take up independently investigations, preparation, and execution of such large scale projects for the development of its water and power resources.

C.W.I.N.C. was, therefore, approached by the Chief Commissioner of Coorg to take up the investigations of the feasible projects in the province, and also to take up the question of renovation of existing irrigation and fish culture tanks. Director Irrigation and Assistant Director toured Coorg in October last, and inspected most of the sites As a result of the inspection, the three projects—Herangi, Barapole and Lakshman. tirtha, were considered suitable for investigations. Main features of these projects are given below (See Index Map):—

Herangi Project.—This project was first conceived in 1877 on representation of an influential zamindar of the place who drew attention to the possibility of utilising the Herangi river as a source of irrigation. A scheme prepared in 1899 for an anicut across Herangi near Herur village was later on abandoned as it was considered unremunerative. Similar attempts at reviving the project were also unsuccessful and the scheme was later on shelved. In order to make it a paying project, a dam with possibility of hydel energy along with irrigation is envisaged. A suitable site near the boundary of Herangi and Halgunda villages in the narrow gorge has now been located and is considered suitable for about 100' high dam. It would be affording irrigation to about 7,000 acres and generate about 1,800 kws of continuous power.

Barapole Project..—This project envisages two dams about 100'—150' high, one each on Konganahole and Kokatahole, the two tributaries of the Barapole river, and through pipes leading the discharge about 4 miles away, so that a head of about 1500' is available for power. The total power available from these two dams is estimated to be about 47,700 KWs of firm power. The power can be utilised in Madras Presidency for the adjoining districts of Malabar and South Kanara which are in need of it. It will also give impetus to new industries being started in Coorg province itself.

Lakshmantirtha Project:—This project originally prepared in 1941 consists in having an anicut across Lakshmantirtha river just below its confluence with Ramtirthahole. The anicut will supplement water required to irrigate about 3,000 acres in Coorg province. The execution of the project was however objected to by the Mysore Government as in their view it would have had detrimental effect on the existing irrigation lower down the river in Mysore territory. To speed up agreement it is proposed to hold a meeting of the engineering representatives of the C.W.I.N.C., Madras Government and Mysore Government to go into the question whether it would be possible to allow the construction of an anicut, or it would be necessary to provide storage at the site. Survey and investigation work will have to be done for either project.

An overall estimate of Rs. 6,64,700 has been framed to carry out the surveys and investigations work on all the three projects, and to put up proposals for renovation of irrigation tanks. Surveys of the reservoir areas and dam sites provided in the estimate are proposed to be carried out by the survey of India Department, whereas the surveys for the irrigation areas would be done by the C.W.I.N.C. staff. Property surveys, electric load surveys and mineral surveys have also been included in the estimate. investigations, including boring and drilling in the abutments and foundation, are proposed to be carried out in conjunction with the Geological Department and have been adequately provided for in the estimate. Fixing of new rain gauges, temperature and humidity recording stations shall be set up and read by the Meteorological. Department. Discharge and silt observations are proposed to be recorded regularly and have been provided for in the estimate. To carry out these investigations it is proposed to open one division with three sub-divisions along with the requisite staff for two years, the time which it is estimated the work will take to complete. Necessary provision for this made in the estimate. Provision has also been made for the purchase of necessary office equipment, scientific and ordinary tools and plants, and motor vehicles It is also proposed to house the entire staff in temporary buildings for the duration of the investigations.

M. D. MITHAL,

Director, Irrigation & Waterways.
C. W. I. N. C.

Overall estimate for preliminary surveys and investigations of Irrigation and Hydel Projects in the Coorg Province

I. WORKS			4	1BS	STK	ACT	•						Rs.
II. TOOLS AND PLANT III. ESTABLISHMENT .	· :	:	:		•	•	•	•		:	: •	:	2,11,260 1,1 <b>4,</b> 240 3,39,240
											Tot	al	6,64,740
				DE	TA	ILS							
-I. Works— (i) Dams and Appurtenant	t Work	8											
Preliminary Expenses:- 1. Survey of the reserve contours @ 10'—5f	oir bas							ınd sı	ırvey	and j	plotti	ng	
10 sq. miles @ Rs. 375/ sq. mile						•						:	3,750
2. Survey of the Dam s plotting on a scale 1,280 acres @ Rs. 4/- p	of 32"= er acre	=1 m	ıle •	•									5,120
3. Geological investigat core drilling, drifts	etc:	found	ations	oft	he d	ams a	nd we			ludin	g bor	ing,	
Kokatahole dam Konganahole dar			•	•		•	•	15 N 15 N					
Herangi dam	•				•	•	•	15 N	os.				
Lakshmantirtha	weir	•	•		•	•	•	5 1	los.				
FO. N.T	00.61.6	- <b>-</b> -		c				50 N	Tos.				<b>XO.000</b>
50 Nos. each of 50'-250 4. Soil Analysis for ear				r ioo			•	•	•	•	•	•	50,000 2,000
(II). Buildings: Temporary Buildings													5,000
(III). Main Canals and bran				_ 6									
I. Surveys of the comm Herangi. Lakshamantirtha	nanded	areas	for ali	gnm	ent c	of can	. 7	,000 a					
							-	,000 4					
10,000 acres @ 1/2/- pe	er acre							•	•				11,250
2. Miscellaneous survey					•	•						•	4,000
3. Longitudinal section		e rivers	andi	its tr	ibuta	ries 4	0 mile	es @	Rs. 2	5/- pe	: mile		1,000
(IV). Discharge and silt obs. One boatman and 4 K etc. included.			ch dis	char	ge sit	e, cos	t of r	opes,	disch	arge 1	ods,	floats	
3 s (V) Meteorological Observati	sites @ ions.	Rs. 5,	000/-	per s	site p	er yea	ar for	2 yrs.	•	•	•	•	30,000
Raingauges, temperatu	re, hur	nidity	etc. o	bserv	vatio	ns L.S			•	•	•	•	2,000
(VI). Mineral surveys .	•	•	•	•	•	•	.L.		•	•	•	•	2,000
(VIII). Electric load surveys (VIII). Economic and Prop		· ·	•	•	•	•	L. L.		•	•	•	•	10,000
(IX). Communications	perty st	wveys	•	•	•	•		iD,	*	•	•	•	K 000
(X). Special tools and plant	s. ·	•	·	•									5,000 5,000
1. Diamond drill com	• .				•	•	L.		•	•	•	•	5,000 5,000
Testing apparatus	plete v s and l	vith acaborate	cessor ory eq	ies @ uipn	) Rs. nent	60,00	L.	3.		•	•	•	
Testing apparatu	plete v s and l	vith acaborate	cessor ory eq	ies @ uipn	) Rs. ient	60,06	L.	3.	:	•	:	•	5,000 60,000
Testing apparatu	s and l	aborato	ory eq	ies @ uipn	Rs. nent	60,06	L.	3.	· :	•	•	:	5,000 60,000 11,000 2,07,120 4,140
Testing apparatu	s and l	aborato gencies	ory eq	uipn	n Rs.	60,00	L.	3.		:	:	:	5,000 60,000 11,000 2,07,120 4,140 2,11,260
Testing apparatus 2% s	s and I	aborato gencies Total	Work	uipn •	ent.		L.:	S. h.	•	•	•	:	5,000 60,000 11,000 2,07,120 4,140
Testing apparatus  2%  II. Tools and Plants.—  1. Motor vehicles for sur	s and I conting	aborato gencies Total	Work	uipn •	ent.		L.:	S. h.	•	•	•	:	5,000 60,000 11,000 2,07,120 4,140 2,11,260 £2,11,260
Testing apparatus 2% s	s and l conting	aborato gencies Total	Work	uipn •	ent.		L.:	S. h.	•	•	•	:	5,000 60,000 11,000 2,07,120 4,140 2,11,260
II. Tools and Plants.—  1. Motor vehicles for sur Maintenance for 2 year  2. Scientific instruments 3. Ordinary tools and pl	conting	aborato gencies Total	Work	uipn •	ent.		L.:	S. h.				·	5,000 60,000 11,000 2,07,120 4,140 2,11,280 4 20,000 10,000 5,000
Testing apparatus  2%  11. Tools and Plants.—  1. Motor vehicles for sur Maintenance for 2 year  2. Scientific instruments  3. Ordinary tools and pl  4. Camp Equipage	conting	aborato gencies Total	Work	uipn •	ent.		L.:	S. h.					5,000 60,000 11,000 2,07,120 4,140 2,11,260 12,11,260 4 20,000 10,000 5,000 15,000
II. Tools and Plants.—  1. Motor vehicles for sur Maintenance for 2 year  2. Scientific instruments 3. Ordinary tools and pl	conting	aborato gencies Total	Work	uipn •	ent.		L.:	S. h.	•				5,000 60,000 11,000 2,07,120 4,140 2,11,280 4 20,000 10,000 5,000
Testing apparatus  2%  11. Tools and Plants.—  1. Motor vehicles for sur Maintenance for 2 year  2. Scientific instruments  3. Ordinary tools and pl  4. Camp Equipage  5. Office furniture  6. R & C of T & P  .	conting	aborate gencies Total rties 6	Work Vehice	uipn •	ent.		L.:	S. h.					5,000 60,000 11,000 2,07,120 4,140 2,11,260 <u>\$2,11,260</u> 4 20,000 10,000 5,000 15,000 15,000
Testing apparatus  2%  11. Tools and Plants.—  1. Motor vehicles for sur Maintenance for 2 year  2. Scientific instruments  3. Ordinary tools and pl  4. Camp Equipage  5. Office furniture  6. R & C of T & P  2%	conting vey pars setc. lants contin	aborate gencies Total rties 6	Work Vehice	uipm	2 Rs.		L.:	S. h.					5,000 60,000 11,000 2,07,120 4,140 2,11,260 4 20,000 10,000 5,000 15,000 15,000 1,12,000
Testing apparatus  2%  II. Tools and Plants.—  1. Motor vehicles for sur Maintenance for 2 year  2. Scientific instruments  3. Ordinary tools and pl  4. Camp Equipage  5. Office furniture  6. R & C of T & P  2%  III. Establishment.	conting vey pars setc. lants contin	gencies Total rties 6	Work Vehice	uipm	2 Rs.		L.:	S. h.					5,000 60,000 11,000 2,07,120 4,140 2,11,260 4 20,000 10,000 5,000 15,000 5,000 1,12,000 2,240 1,14,240
II. Tools and Plants.—  1. Motor vehicles for sur Maintenance for 2 year  2. Scientific instruments  3. Ordinary tools and pl  4. Camp Equipage  5. Office furniture  6. R & C of T & P  2%  III. Establishment  1. Pay of Officers Executive Engineer 1	continution of the state of the	gencies Total rties 6	Work Vehice sand I	ss s Plant	Rs.	. 7,000	L.:	S. h.					5,000 60,000 11,000 2,07,120 4,140 2,11,260 4 20,000 10,000 5,000 15,000 5,000 1,12,000 2,240 1,14,240
II. Tools and Plants.—  1. Motor vehicles for sur Maintenance for 2 year  2. Scientific instruments  3. Ordinary tools and pl  4. Camp Equipage  5. Office furniture  6. R & C of T & P  2%  III. Establishment.  1. Pay of Officers. Executive Engineer 1 Assistant Engineer 3	conting vey pars retc. lants	gencies Total rties 6	Work Vehice	s s lles &	Rs.	. 7,000	L.:	S. h.					5,000 60,000 11,000 2,07,120 4,140 2,11,260 4 20,000 10,000 5,000 15,000 15,000 1,12,000 2,240 1,14,240 1,14,240 1,14,240 1,14,240
Testing apparatus  2%  II. Tools and Plants.—  1. Motor vehicles for sur Maintenance for 2 year  2. Scientific instruments  3. Ordinary tools and pl  4. Camp Equipage  5. Office furniture  6. R & C of T & P  2%  III. Establishment  1. Pay of Officers. Executive Engineer 1	vey pars retc. ants contin Total No. @ Nos. @	gencies Total rties 6 gencies Total rties 6 gencies	Work Vehice	s s lles (	Rs.	. 7,000	L.:	S. h.					5,000 60,000 11,000 2,07,120 4,140 2,11,260 (2,11,260 4 20,000 10,000 5,000 15,000 15,000 1,12,000 2,240 1,14,240 1,14,240 1,14,240

## 2. Pay of Establishment.— Supervisors 12 Nos. @ Re

Supervisors 12 Nos. @ Rs. 240/- p.m. for 2 years				•				09,120
Accountant I No. @ Rs. 200/- p.m. for 2 years								4,800
Head Clerk 1 No. @ Rs. 180/- p.m. for 2 years								4,320
Clerks 8 Nos. @ Rs. 93/- p.m. for 2 years .								17,856
Draftsmen 2 Nos. @ Rs. 200'- p.m. for 2 years								9,600
Tracers 2 Nos. @ Rs. 104 p.m. for 2 years .								4,992
Daffadars 1 No. @ Rs. 33 - p m. for 2 years .								792
Barkandaz 1 No. @ Rs. 33/- p.m for 2 years								792
Peons 8 Nos. @ Rs. 33/- p.m. for 2 years								6,322
Khalasis 12 Nos. @ Rs. 33/- p.m. for 2 years $\cdot$	•							9,504
Dak runners 4 Nos. @ Rs. 33/- p.m. for 2 years	•	•						3,162
	•						Rs.	1,31,260
Dearness allowances for Officers for 2 years lump s	um							10,000
Dearness allowance for establishment for 2 years I	ump	sum		•		•		50,000
								60,000
T.A. for officers for 2 years lump sum .								24,000
T.A. for Establishment for 2 years lump sum .	•	•	•	•				32,000
• • •								56,000
							Rs.	3,32,580
2 % contingencies	•	•	•	•	•			6,660
Total Establishment				•	•		Rs.	3,39,240
							-	3,39,240
Grand Total	٠.	•		•			Rs.	6,64,740

M. D. MITHAL,

Director, Irrigation & Waterways
C. W. I. N. C.

Estimate for preliminary surveys and investigation of Irrigation and Hydel Projects in the Province of Coorg, which was originally submitted to Government

## ABSTRACT

T WADES			_									80.000
I. WORKS II. TOOLS AND PLANTS .	•	•	•	•	•		•	•	•	•	• •	60,000
III. ESTABLISHMENT .	•	•	•	•	•		•	•	•	•	•	40,000
III. DOINDHIDHANI	•	•	•	•	•	,	,	•	•	•	• •	1,24,000
											Total	2,24,000
			,	n 1777		T (1					-	
			1	DEI	'AI.	LB						
I. Works												
Surveys												Rs.
Surveys of the Reservoir Area 6	000.	agtas	@ B	s. 2/	- aety		_		_	_		12,000
Irrigation Area, 10,000 acres @			-	-			•				•	5,000
Property, Surveys, etc.		٠.		•				•	•		•	3,000
Exploration Work—Equipment & S	Staff											•
Drilling, boring etc. 4 sites @ F			аħ									16,000
Staff and other geological surve				•	•	•	•	•	• •	•	•	4,000
Temporary Buildings, Gauge Reads	-		!a	•	-	•	•	•	•	·	•	2,000
				. (0)								
S. D. O. quarters temporary (al		8tive	tents	(3)	at H	s. 2,0	000/-	•	•	•	•	7,500
Overseer's Huts (12) @ Rs. 750 Gauge Readers' Huts etc	·/- ·		•	•	•	•	•	•	•	•	•	9,000
-	•	•		•	•		•	•	•	•	•	3,500
Total—Works	s .		•	•	•	•	•	•	•	•	•	60,000
II. Tools and Plant												
Furniture for Divisional and Su	b- <b>D</b> iv	vision	Offic	<b>:0</b> 8	•	•		•		•	•	5,000
Comp furniture	•		•	•	•		•	•	•	•	•	2,009
Transport vehicle and its maint	enan	ce .		•	•	•	•	•	•	•	•	15,000
Instruments Level, Theodolite			•		•	•	٠	•	•	•	•	10,000
Current meters, boats etc. for di	ischa	rge ar	nd ot	her o	bserv	ration	ns.	•	•	•	•	8,000
Total—Tools	and :	Plant		•	•	. `		•	•	•	•	40,000
III. Establishmen t.—											-	<del></del>
(a) (1) Pay of Officers —				100								
1 Executive Engineer for 12 m		_				•	•	•	•	•	•	10,800
3 Sub-Divisional Officers for 12	mon	uns @	Ks.	500/-	· p.m	• •	•	•	•	•	•	18,000
Total .	•	•		•	•	•	•	•	•	•	•	28,800
(2) Pay of Establishment.—											<del></del>	
12 Supervisors for 12 months @	Ra.	150/-	71.333.		_			_				21,600
1 Accountant for 12 months @		-	_			•	•	:	•	•	•	2,400
1 Head clerk for 12 months @ 1			•	•	•	•	•	•	•		•	1,920
8 clerks for 12 months @ Rs. 80						•			•	•	•	7,680
2 Draftsmen for 12 months at F	Rs. 10	00/- p	m.					•			•	2,400
2 Tracers for 12 months at Rs.	60/- <u>1</u>	p.m.		•	•	•	•		•		•	1,440
1 Dafadar for 12 months at Rs.	•	-		•	•	•	•	•	•	•		360
2 Barkandazes for 12 months at		_	o.m.	•	•	•	4	•	•	•	•	720
8 Peons for 12 months at Rs. 30				•	•	•	•	•	•	•	•	2,880
6 Dak runners for 12 months at	Rs.	30/- E	.m.		•	•	•	•		•	•	2,160
Total—Establ	lishm	ent .		•	•	•	•	•	•	•	•	43,560
(3) Dearness Allowance of Offic	ers -	-lump	sun	1	•				•			4,000
(4) Dearness Allowance, other	allow	ances	of	Esta	blish	men	t-—l	ump s	um	•		20,000
Tota	al .					•	•		•	•		24,000
(5) T.A. of Officers												0.400
(6) T.A. of Establishment	•	•	1	•	•	•	•	•	•	•	•	8,400
(b) Establishment Contingencies	•	•		•			•	•	•	•	•	12,960 6,280
					-	•	•	•	•	•	·	· · · · · · · · · · · · · · · · · · ·
Total—Establ	neum	. otto	•	•	•	•	•	•	•	· ·	•	1,24,000

M. D. MITHAL,

Director, Irrigation & Waterways.

C. W. I. N. C.

# ESTIMATE AS PER INSTRUCTIONS OF AD-HOC COMMITTEE

Estimate for Preliminary Surveys and Investigations in connection with the Irrigation and Hyee Projects in Coorg Province, prepared in accordance with the instructions of the

					A	BST	RACI	י						
I. WORKS	<u>.</u>			•••••	••••		•••••		•••••	• • • • • •			· · • • • • • •	2,02,46
II. TOOLS AN II. ESTABLIS	D PLAN	${f TS}$												79.50
									Tot	AL				4,52,00
PM 7					L	ETA	ILS							
. Works.—		277. 1												
i. Dams and up	-		8:											
Preliminary .  1. Surveys of contours	the reser	voir b	oasins rvals	by a	ir pho	otogra	phy a	nd gr e 10 s	ound s	urvey s @ I	an 3s.37	d plot	ting mile	3,7
2. Survey of t	he damsit	es an	d wei	r site	s by	air p	hotog	raphy	and g	round		rveys		5,1
3. Geological in reservoir	investigati basins by	ions a borir	and for	ounda re-dril	tions ling, :	of th makir	e dan ng drif	isites Its and	and w	eir si elling	tes a etc.	nd of includ	the ing	·
testing : Kokatahole	dam							. :	15 Nos					
Konganaho	le dam							. :	15 Nos	•				
Herangi dar	n.			•			•	. ]	l5 Nos.					
Lakshmant	irtha weir				•	•			5 Nos					
								5	0 Nos.					
50 Nos. each	of 50'=2,6	500′ (	a Rs.	20/- 1	per fo	ot.		•						50,0
4. Soil analysi			-		-		ams in	cludir	ng testi	ing L.	s.	•	•	2,0
(22) Destations										_				
.(ii) Buildings: Temporary bu	uldings		•		•									5,0
(iii) Main Cana	ls and Bro	anches	3 :											.,.
(a) Survey of	the comm	ande	d area	as for	alignı	ment	of can		7 000 -					
Herangi Lakshmanti	irtha	:	:	:	:	•	•		7,000 a 3,000 a					
10,000 acres @	n Re-/9/- 1	ner ac	re	_	_				10,000	acres		_	_	5,5
		PO# 000					•	•	•	•	•	•	•	0,0
-		vs						_					_	4.0
(b) Miscellane (iv) Discharge a	ous Surve nd Silt Ob	- ose <b>rv</b> e	ations			•	•	•	•	•	•	•	•	4,0
(b) Miscellane (iv) Discharge at One boatman discharge equipmen	ous Surve nd Silt Oh and four rods, bo t @ Rs. 5	Kha Kha ats, 1	ations lasies loats, - per	at ea gaug site p	ch di ge, sil er yes	lt san ir 3 si	npler tes fo	and l	Labora ars.	tory	•	•	•	
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic	ous Surve nd Silt Ob and four rods, bo t @ Rs. 5 al Observe	Kha kts, i 5,000/ ations	itions lasies loats, - per s, Rai	at ea gaug site p	ch di ge, sil er yes	lt san ir 3 si	npler tes fo	and l	Labora ars.	tory	•	•	•	30,0
(b) Miscellane (iv) Discharge at One boatman discharge equipmen (v) Meteorologic observations	ous Surve nd Silt Ok and four rods, bo it @ Rs. a al Observa s Lump s	Kha ats, i 5,000/ ations	tions lasies loats, - per s, Rai	at ea gaug site p	ch di ge, sil er yes	lt san ir 3 si	npler tes fo	and l	Labora ars.	tory	•	•	•	30,0 2,0
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo	ous Surve, nd Silt Oh and four rods, bo at @ Rs. a al Observe s Lump s ad Survey	Khai ats, i 5,000/ ations sum	ations lasies floats, - per s, Rai	at ea gaug site p n Gau	ch di ge, sil er yes	lt san ir 3 si	npler tes fo	and l	Labora ars.	tory	•	•	•	30,0 2,0 10,0
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo (vii) Economic a	ous Survey and Silt Oh and four rods, bo at @ Rs. 5 al Observe s Lump s and Survey and properti	Khaiats, if 5,000/ations tum  L.S.	ations lasies floats, - per s, Rai	at ea gaug site p n Gau	ch di ge, sil er yes	lt san ir 3 si	npler tes fo	and l	Labora ars.	tory	•	•	•	30,0 2,0 10,0 5,0
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo (vii) Economic a (viii) Communic	ous Survey and Silt Oh and four rods, bo at @ Rs. & al Observe s Lump s ad Survey and propert ations L.S	Kha ats, i 5,000/ ations um L.S. ty sur	ations lasies floats, - per s, Rai	at ea gaug site p n Gau	ch di ge, sil er yes	lt san ir 3 si	npler tes fo	and l	Labora ars.	tory	•	•	•	30,0 2,0 10,0 5,0
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo (vii) Economic a (viii) Communic	ous Survey and Silt Oh and four rods, bo t. @ Rs. 5 al Observes Lump s and Survey and propertations L.S is and Pla ill complet	Khaiats, in 5,000/eations sum  L.S.  ty sur  nts:	lasies floats, - per s, Rai veys	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	•	•	30,0 2,0 10,0 5,0 5,0
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo (vii) Economic a (viii) Communic (ix) Special Tool 1 diamond dri	ous Surve, and Silt Oh and four rods, bo at @ Rs. 5 al Observe, s Lump so ad Survey and propertations L.S. s and Plattle complete atus and 1	Khaiats, in 5,000/eations sum  L.S.  ty sur  nts:	lasies floats, - per s, Rai veys	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	•	•	30,0 2,0 10,0 5,0 5,0
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo (vii) Economic a (viii) Communic (ix) Special Tool 1 diamond dri Testing appare	ous Surve, and Silt Oh and four rods, bo t @ Rs. 5 al Observe, s Lump s and Survey and propert ations L.S is and Pla il complet atus and l s	Kha ats, 15,000/ ations functions fu	ations lasies floats, per s, Rai veys h acce	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	•		30,0 2,0 10,0 5,0 5,0 60,0 11,0
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo (vii) Economic a (viii) Communic (ix) Special Tool 1 diamond dri Testing appare	ous Survey and four rods, bo to @ Rs. 5 al Observes Lump so ad Survey and propertations L.S is and Pla il complet atus and l s	Kha ats, 15,000/ ations functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions functions fu	ations lasies floats, per s, Rai veys h acce	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	•	-	30,0 2,0 10,0 5,0 5,0 60,0 \$1,0
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo (vii) Economic a (viii) Communic (ix) Special Tool 1 diamond dri Testing appare	ous Surve, and Silt Oh and four rods, bo t @ Rs. 5 al Observe, s Lump s and Survey and propert ations L.S is and Pla il complet atus and l s	Kha ats, 16,000/ ations um L.S. ty sur  nts: e with abora	tions lasies floats, - per s, Rai veys la control cont	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	2,02,4		30,0 2,0 10,0 5,0 5,0 60,0 11,0 1,98,4 3,9
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo (vii) Economic a (viii) Communic (ix) Special Tool 1 diamond dri Testing apparr of sample	ous Surve, and Silt Oh and four rods, bo t @ Rs. t al Observes s Lump s and Survey and propert ations L.S s and Pla tll complet atus and 1 s Total 2 % c	Khai ats, i footoo khai ats, i footoo ka ats, i footoo ka ations sum foo	lasies doats, per s, Rai	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	2,02,4		30,0 2,00 10,0 5,0 5,0 60,0 11,0 1,98,4 3,9
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo (vii) Economic a (viii) Communic (ix) Special Tool 1 diamond dri Testing appar- of sample	ous Survey and Silt Oh and four rods, bo t @ Rs. t al Observes s Lump s and Survey and propert ations L.S s and Pla tll complet atus and 1 2 % c  Total W is — s for survey	Serves  Kha ats, it 5,000/ ations  sum  L.S.  ty sur  ce with abore  contin  Torks  ey pa	tions lasies floats, per s, Rai	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	2,02,4		30,0 2,00 10,0 5,0 5,0 60,0 11,0 1,98,4 3,9 2,02,4
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observations (vi) Electrical Lo (vii) Economic a (viii) Communic (ix) Special Tool 1 diamond dri Testing appara of sample	ous Surve, and Silt Oh and four rods, bo at @ Rs. 5 al Observe, s Lump s ad Survey and propert ations L.S s and Pla atus and 1 s Total 2 % o Total W sts — s for surve nses for 2	Serves  Kha ats, it 5,000/ ations  sum  L.S.  ty sur  ce with abore  contin  Torks  ey pa	tions lasies floats, per s, Rai	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	2,02,4		30,0 2,00 10,0 5,0 5,0 60,0 11,9 2,02,4 25,00 10,0
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observations (vi) Electrical Lo (vii) Economic a (viii) Communic (ix) Special Tool 1 diamond dri Testing appara of sample  I. Tools and Plan 1. Motor vehicle Running exper	ous Surve, and Silt Oh and four rods, bo at @ Rs. 5 al Observe, s Lump s ad Survey and propert ations L.S s and Pla tl complet atus and 1 2 % c  Total W s for surve nses for 2 ruments	Serves Kha.  ats, 1 5,000/ ations  aum  / L.S.  ty sur  .  continuous  continu	tions lasies floats, per s, Rai	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	2,02,4		30,0 2,00 10,0 5,0 60,0 \$1,0 1,98,4 3,9 2,02,4 25,00 10,0 10,0
(iv) Discharge as One boatman discharge equipmen (v) Meteorologic observations (vi) Electrical Lo (vii) Economic a (viii) Communic (vii) Special Tool 1 diamond dri Testing appara of sample  I. Tools and Plan 1. Motor vehicle Running exper 2. Scientific inst 3. Ordinary tool	ous Surve, and Silt Oh and four rods, bo t @ Rs. 5 al Observe, s Lump s and Survey and propert ations L.S s and Pla tl complet atus and 1 2 % c  Total W ts — s for surve nses for 2 ruments s and plas	Serves Kha.  ats, 1 5,000/ ations  aum  / L.S.  ty sur  .  continuous  continu	tions lasies floats, per s, Rai	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	2,02,4		30,0 2,00 10,0 5,0 60,0 \$1,0 1,98,4 3,9 2,02,4 25,00 10,0 3,0
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(iv) Discharge as One boatman discharge equipmen (v) Meteorologic observations (vi) Electrical Local (vii) Economic as (viii) Communical (	ous Survey and Silt Oh and four rods, bo to @ Rs. 5 al Observey and propert ations L.S and Platt atus and last Total Wise — s for survey mses for 2 ruments s and plant ge re	Serves Kha.  ats, 1 5,000/ ations  aum  / L.S.  ty sur  .  continuous  continu	tions lasies floats, per s, Rai	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	2,02,4	160	30,0 2,00 10,0 5,0 60,0 \$1,0 1,98,4 3,9 2,02,4 25,00 10,0 10,0 15,0 10,0
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(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observations (vi) Electrical Lo (vii) Economic a (viii) Communic (ix) Special Tool 1 diamond dri Testing appara of sample  I. Tools and Plan 1. Motor vehicle Running exper 2. Scientific inst 3. Ordinary tool 4. Camp equipag 5. Office furniture	ous Survey and Silt Oh and four rods, bo to @ Rs. 5 al Observey and propert ations L.S and Platt atus and last Total Wise — s for survey mses for 2 ruments s and plant ge re	Serves Kha.  ats, 1  5,000/ ations  L.S.  y sur  contin  rorks  e witl  abora  .  .  .  .  .  .  .  .  .  .  .  .  .	ations lasies doats, - per s, Rai constant of the second o	at ea gaug site p n Gau L.S.	ch di ge, sil er yes iges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	2,02,4	160	30,0 2,0 10,0 5,0 5,0 60,0 11,0 1,98,4 3,9 2,02,4 25,0 10,0 10,0 15,0 10,0 78,0
(b) Miscellane (iv) Discharge at One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo (vii) Economic a (viii) Communic (ix) Special Tool 1 diamond drii Testing appara of sample  I. Tools and Plan 1. Motor vehicle Running exper 2. Scientific inst 3. Ordinary tool 4. Camp equipas 5. Office furnitu 6. R. & C. T. &	ous Survey and Silt Oh and four rods, bo at @ Rs. t al Observes s Lump s ad Survey ations L.S s and Pla ill complet atus and l 2 % c  Total W ats — s for surve nses for 2 ruments s and plan ge .  Total 2% cont	serves Kha. ets, 1 5,000/ ations um / L.S. ty sur	ations lasies doats, - per state of the control of	at ea gaug site p n Gau L.S.	ch di ge, sil ge, sil ges, t	lt san ar 3 si cempe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•	2,02,4	************	30,0 2,00 10,0 5,0 60,0 11,0 1,98,4 25,00 10,0 10,0 15,0 10,0 5,0 78,0 1,5
(b) Miscellane (iv) Discharge as One boatman discharge equipmen (v) Meteorologic observation (vi) Electrical Lo (vii) Economic a (viii) Communic (ix) Special Tool 1 diamond dri Testing appara of sample  I. Tools and Plan 1. Motor vehicle Running exper 2. Scientific inst 3. Ordinary tool 4. Camp equipag 5. Office furnitus 6. R. & C. T. &  I. Establishment 1. Pay of Officers	ous Survey and four rods, bo to and four rods, bo to and four rods, bo to a constant and property ations L.S. is and Platter at and 1 complet at at and 1 complet at so for survey and platter for survey and survey	Serves Kha. eats, 16,000/ ations with the continuous of L.S. e with abora continuous of the continuous	ations lasies doats, - per s, Rai cory cory cory cory cory cory cory cory	at ea gaug site p in Gau 	ch di ge, sil ge, sil ges, t ges, t	tt sam r 3 si empe	npler ites for rature	and lar 2 yes, hum	Labora ars. nidity	tory	•		************	30,0 2,00 10,0 5,0 60,0 11,0 1,98,4 25,00 10,0 10,0 15,0 10,0 5,0 78,0 1,5
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2. Pay of Establishment .

2. Lug of Detaonamien.									
Overseers 8 @ Rs. 240/- p.m. Senior Clerks 2 @ Rs. 150/- p Junior Clerks 2 @ Rs 93/- p Dafadars 2 @ Rs 33/- p m fo Gauge Readers 3 @ Rs. 70/- p Peons 4 @ Rs 33/- p m for Khalasis 8 @ Rs 33/- p m fo Chawkidars 2 @ Rs. 33/- p m Dak Runners 2 @ Rs. 33/- p m	.m. for two m. for two m. for two o two years or two years or two years for two m. for two years or two years	years years years years		:				46 059 7,200 4,464 1,584 5,040 3,168 6,336 1,584 1,584	
3. Dearness Allowance of officer				•	•	•		4,800	
4. Dearness Allowance of Estab	u-nment	•	٠	•	•	•	-	20,000	
Total .		•	•	•		•	-	24,800	
5. T.A. of Officers .					•			8,000	
6. T.A. of establishment	•	•		•	•	•	_	12,000	
Total .	•	•		•		•	_	20,000	
Total . Contingencies @	2%.	:	:	:	•	:	:	1,66,720 3,320	
Total—Establis	hment .	•						1,70,040	1,70,040
Grand	Total						-		4,52,000
Estimate for Year	(Details as	s unde	r) .	•				1948-49 2,20,000	1949-50 2,32,000
Estimate for Prelimin Province for the year 1948	ary inves -49 and I	tigati 1949-	ons 50.	of I	rriga	tion	and	Hydel Projects	in Coorg
I. Works								1948-49	1949-50
(i) Dam and Appurtenent Wo Surveys and investigations:-									
1. Survey of basin reservoir								1,800	1,950
2. Survey of the damsite			•	•	•	·	·	2,560	2,560
3. Geological investigations	•	•	•	•	•	•	•	2,000	50,000
4. Soil analysis for earthen		•		•	•		·	1,000	1,000
(ii) Buildings.— Temporary Buildings		•						5,000	2,000
(in) Main Canals and branches	3,	•	•	•	•	•	-	<b>0,</b> 000	••
(a) Survey of the commande		•				•	•	5,625	••

M. D. MITHAL,
Director (Irrigation & Waterways),
C. W. I. N. C.

15,000

2,000

5,000

2,500

2,500

11,000

55,480 79,500 85,020

2,20,000

1,495

4,000

15,000

5,000

2,500

2,500

60,000

2,470

1,46,980

85,020

2,32,000

(b) Miscellaneous Surveys

(iv) Discharge and silt observations.

(v) Meteorological observations (vi) Electrical load survey . . .

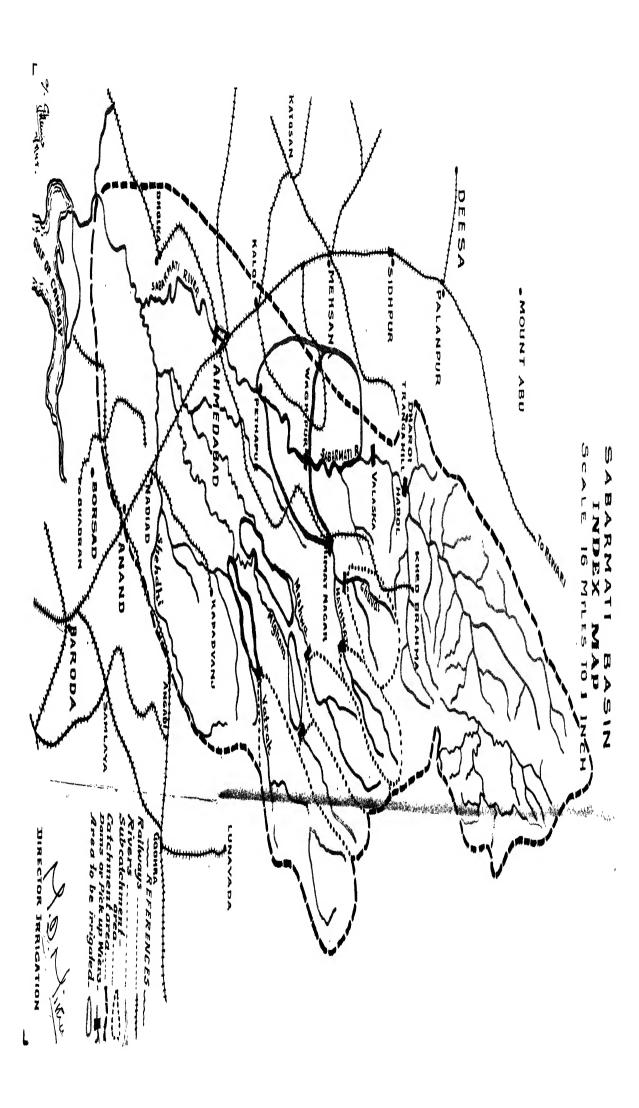
(vii) Economic and property surveys

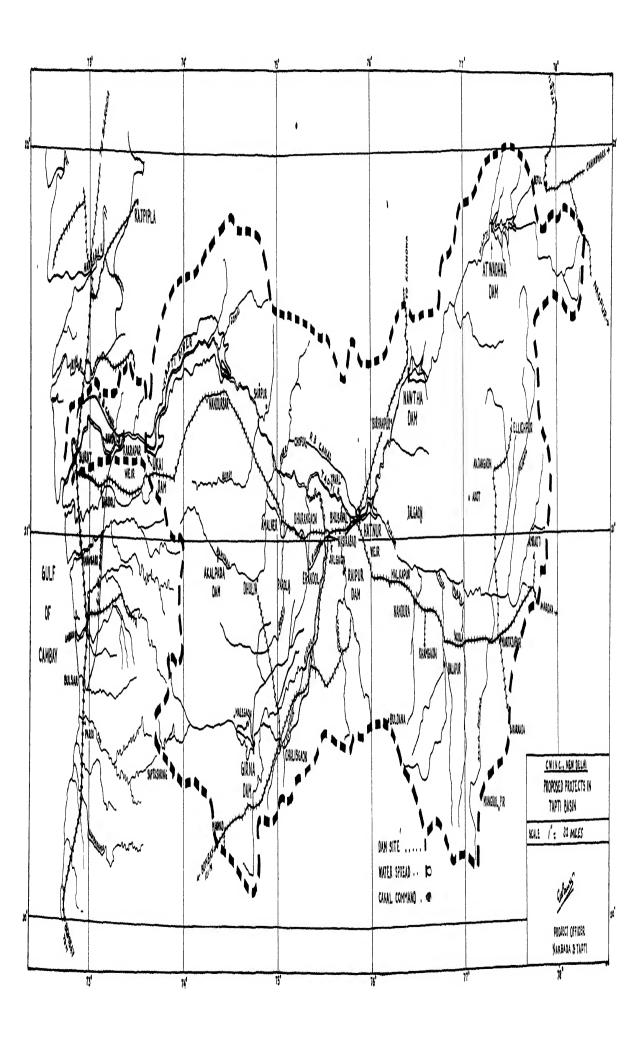
(xx) Special tools and plants.
Testing samples, laboratory etc.
Contingencies

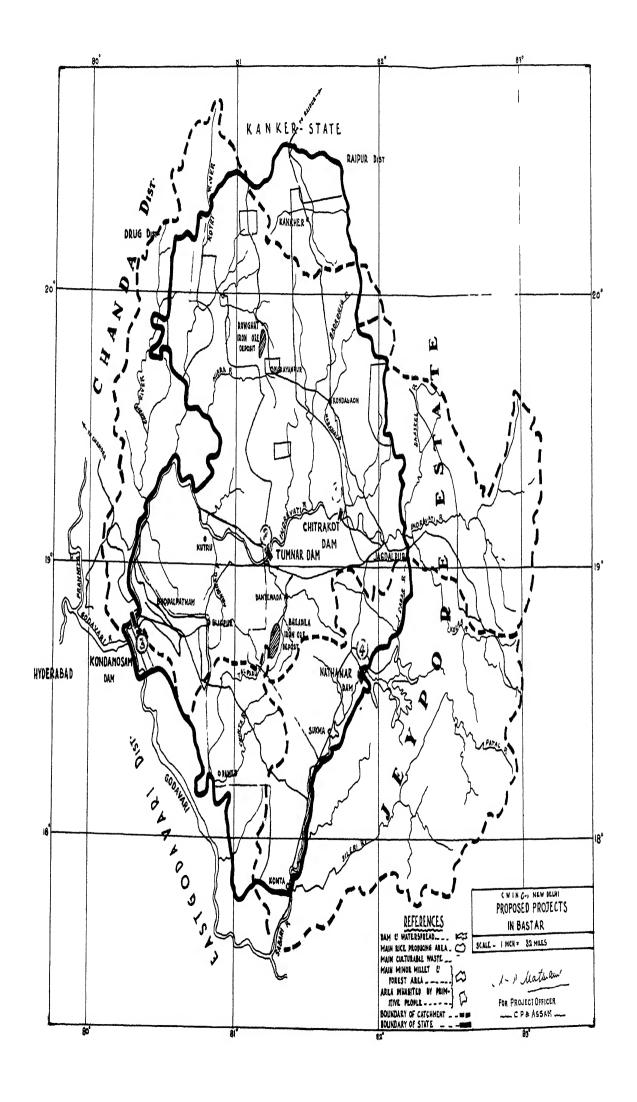
Grand Total

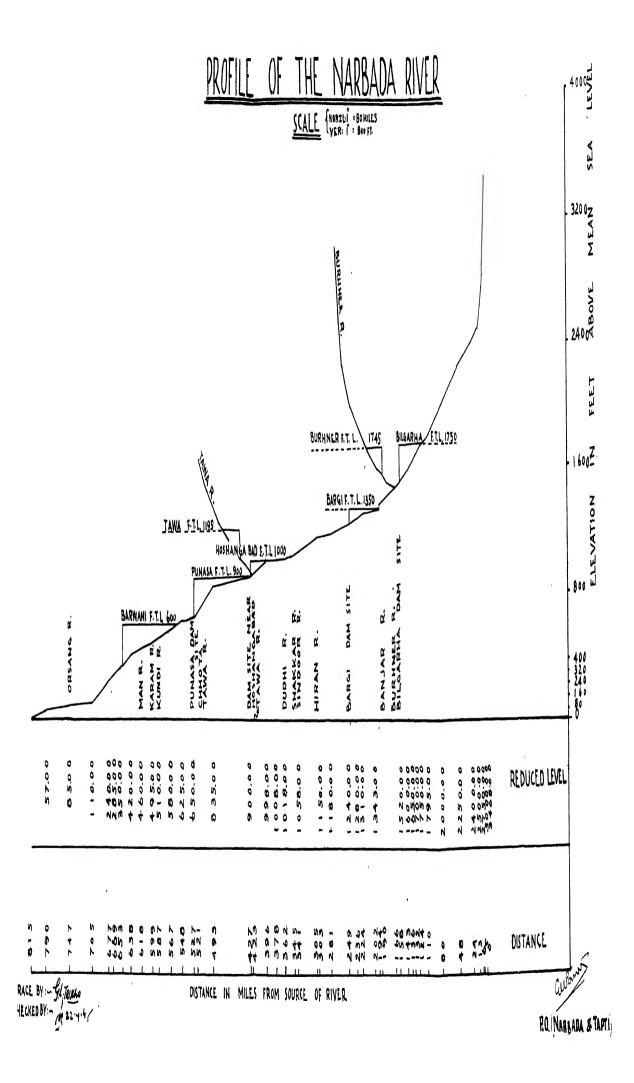
(viii) Communications

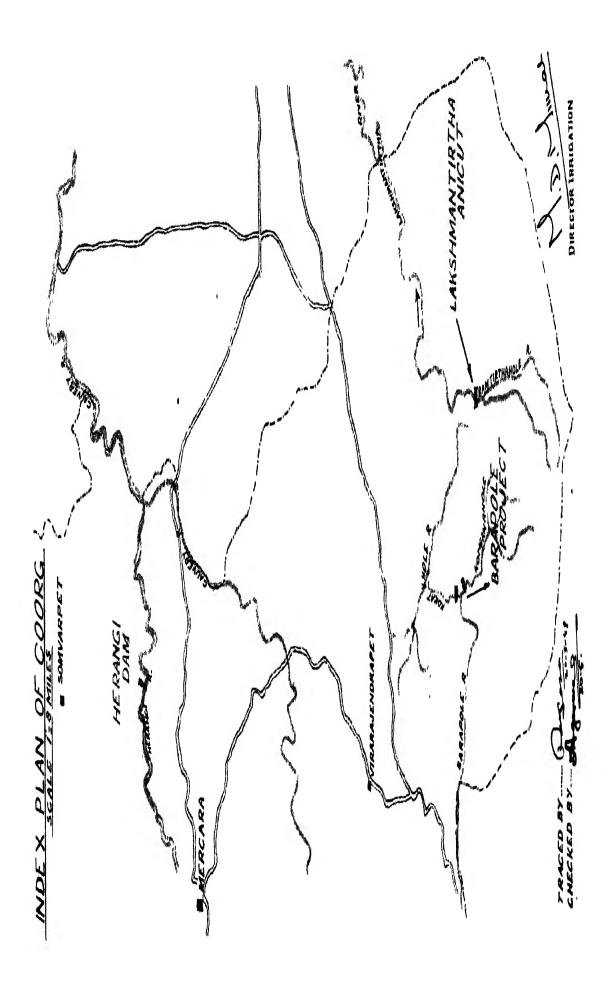
II. Tools and Plants III. Establishment

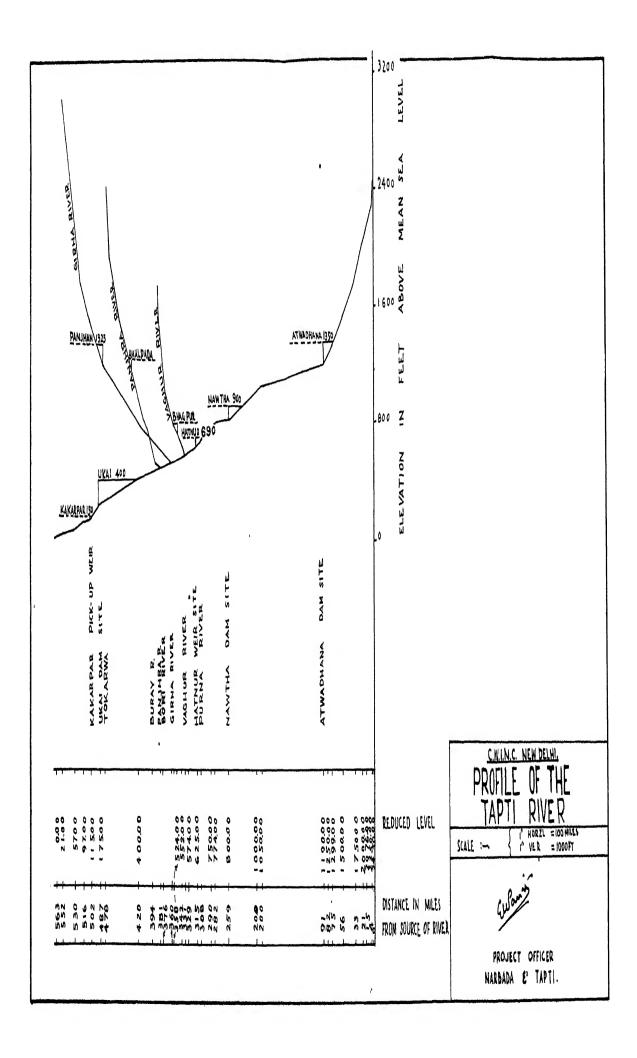


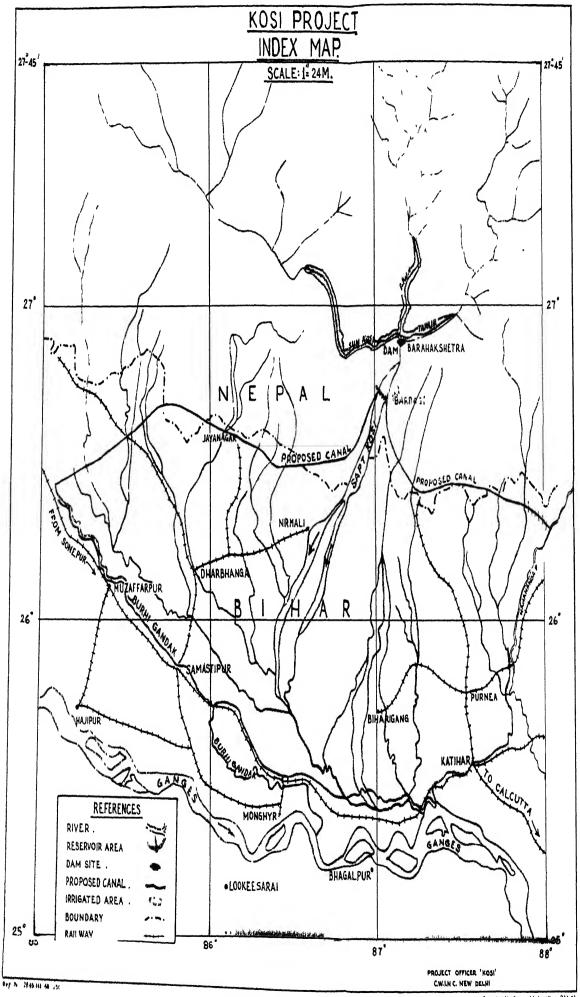


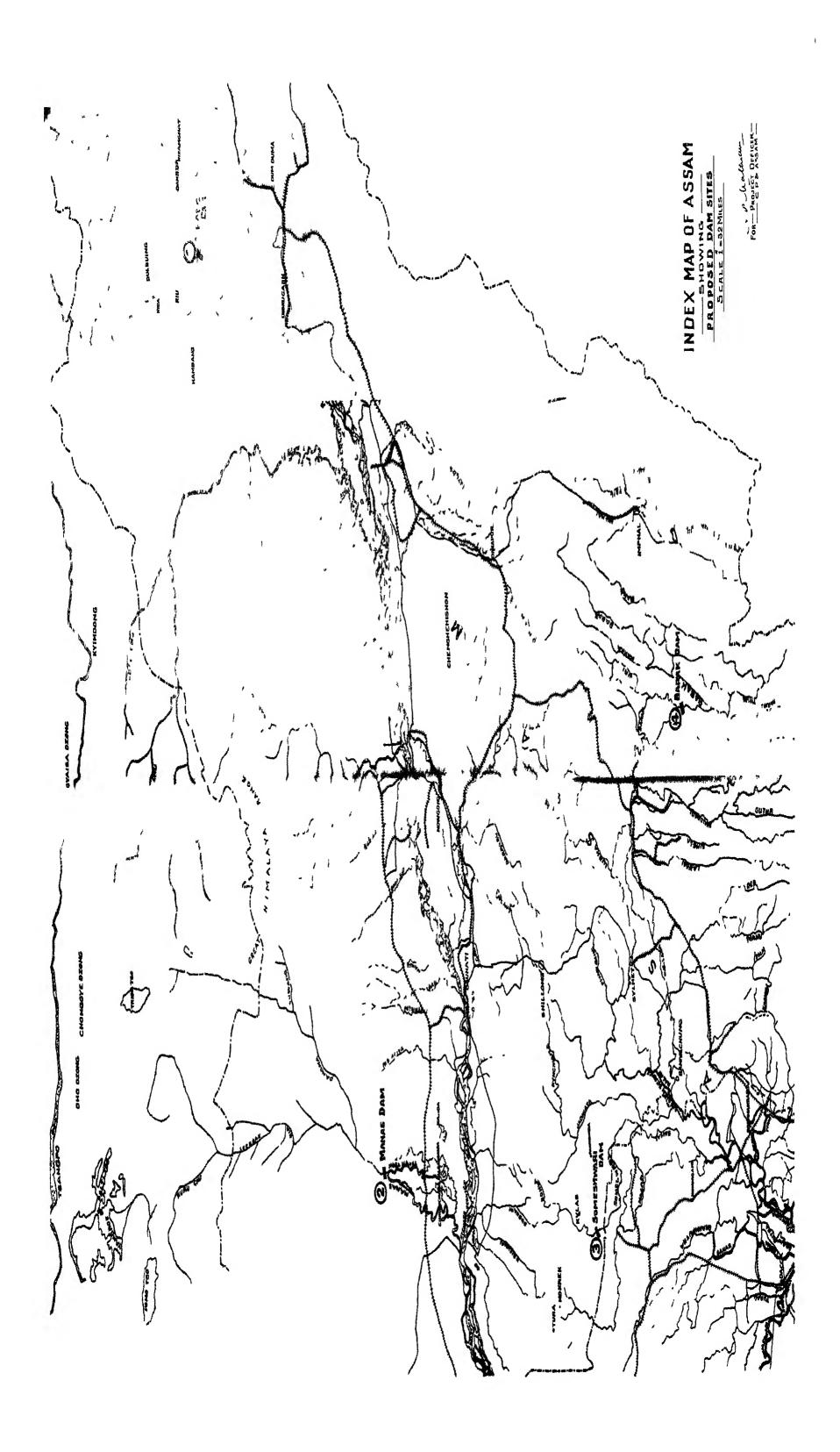




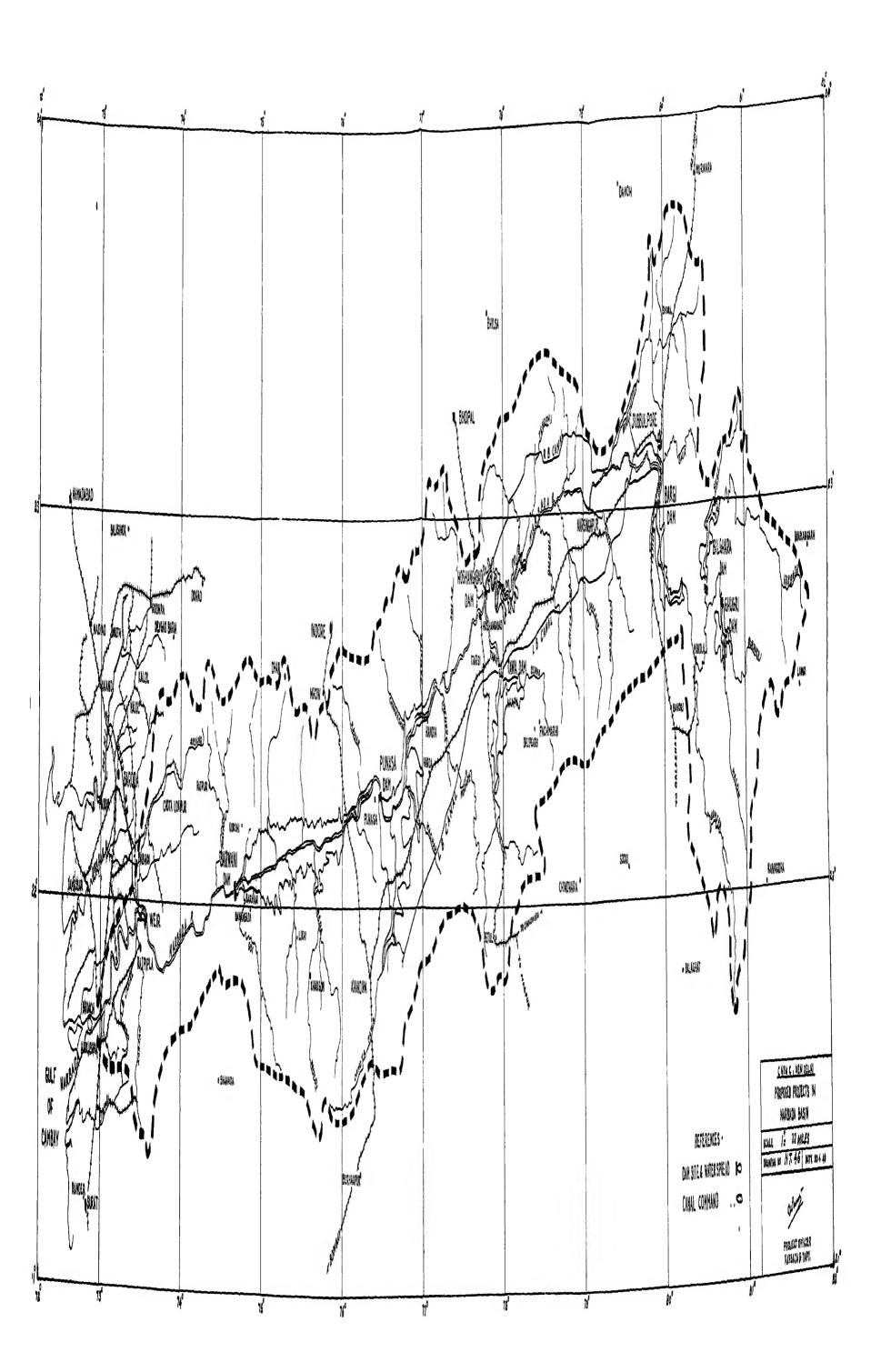








INDEX MAP OF CENTRAL PROVINCES



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